Report of the Work of The Rubber Research Board in 1952

(*Established under the Rubber Research Ordinance Chapter* 302)

June, 1953

COMMONWEALTH MYCOLOGICAL INSTITUTE
28 SEP 1953

Report of the Work of The Rubber Research Board in 1952.

The present report is the twenty-second annual report of the Rubber Research Institute of Ceylon as constituted under the Rubber Research Ordinance and amended by the Rubber Research (Amendment) Acts No. 27 of 1948 and No. 30 of 1951.

CHAIRMAN'S REPORT

Chairman.—Mr. W. A. Paterson, J.P., functioned as Chairman until his resignation on 15th December. Mr. W. P. H. Dias, J.P., was elected Chairman at a special meeting held on 23rd December. Dr. H. E. Young (Director and permanent Vice-Chairman) acted as Chairman during the interim period.

Board Membership.—The three-year period of membership of the following members terminated during the year and appointments to fill the vacancies were made as indicated below :—

Mr. J. L. D. Peiris, 21st January — Mr. W. P. H. Dias, J.P., nominated.

Mr. Francis Amarasuriya, 21st January — Mr. W. Herbert de Silva nominated.

Major Montague Jayawickrema, M.P., 21st July — Renominated.

Mr. F. A. Obeyesekera, 1st February — Gate Muhandiram Arthur D. S. Jayasinghe nominated.

A special vote of thanks was accorded to Mr. Obeyesekera who had served on the Board since July, 1931.

The following further changes in membership occurred during the year :

Mr. R. J. Hartley was on leave from 14th April until 7th October and Mr. F. A. Ruck was nominated to act for him during this period.

Senator C. F. W. Wickremasinghe was nominated to represent the Senate with effect from 21st July in place of Mr. C. Wijesinghe.

Mr. W. A. Paterson resigned and Mr. G. H. Dulling was nominated in his place with effect from 16th December.

The personnel of the Board at the end of 1952 was as follows :—

Ex-Officio Members :—

The Director, R.R.I.C. — Dr. H. E. Young (Vice-Chairman)

The Director of Agriculture — Dr. A. W. R. Joachim

Representing the Minister of Finance — Mr. R. H. Wickremasinghe, Controller of Supply & Cadre.

Nominated Members :—

Representing the Senate — Senator C. F. W. Wickremasinghe.

Representing the House of Representatives — Major Montague Jayawickrema, M.P.

Representing the Smallholders — Gate Muhandiram Arthur D. S. Jayasinghe

Representing the Planters Association of Ceylon — Mr. R. J. Hartley & Mr. G. H. Dulling

Representing the Low Country Products Association—Mr. W. P. H. Dias, J.P., (Chairman) and Mr. W. Herbert de Silva

Meetings of the Board were held on 15th January, 10th March, 19th May, 31st July, 27th October and 23rd December.

Committees :—

Experimental Committee.—Messrs. W. P. H. Dias, R. J. Hartley and Gate Muhandiram Arthur D. S. Jayasinghe were nominated to serve on the Committee with effect from 19th May in place of Messrs. F. A. Obeyesekera, J. L. D. Peiris and Francis Amarasuriya whose membership of the Board had terminated. The personnel of the Committee at the end of the year was as follows :—

Mr. W. P. H. Dias
Mr. R. J. Hartley
Dr. A. W. R. Joachim
Mr. G. H. Dulling
Gate Muhandiram Arthur D. S. Jayasinghe
The Director (Dr. H. E. Young)

Smallholdings Committee.—Mr. W. P. H. Dias, Gate Muhandiram Arthur D. S. Jayasinghe and the Director (Dr. H. E. Young) were nominated to serve on this Committee with effect from 19th May. There were no changes in membership since that date.

Ad hoc Committees.—A Committee consisting of the Director, Mr. W. P. H. Dias, Mr. W. Herbert de Silva, Dr. A. W. R. Joachim and Sir Ivor Jennings (Vice-Chancellor, Ceylon University) was appointed to interview candidates for appointment as Research Assistants.

A meeting of the Committee was held on 6th October.

London Advisory Committee for Rubber Research (Ceylon & Malaya).—The Board contributed jointly with the Rubber Research Institute of Malaya to the cost of research on the quality and utilisation of raw rubber carried out at the Imperial Institute, London, under the control of the London Advisory Committee for Rubber Research (Ceylon & Malaya).

Meetings of the Committee and Sub-Committees were held as follows :—

London Advisory Committee — 7th March, 6th June and 7th November

Technical Sub Committee — 28th February, 5th June and 23rd October

Executive Committee — 8th February and 3rd October

Latex Sub Committee — 2nd May

Agricultural Sub Committee — 22nd May and 25th November

FINANCE

Income.—The Board's main income was derived from the cess on exports of rubber under Section 6(1)a of the Rubber Research Ordinance. Income from this source was less than the estimate for the year by Rs. 78,314.

Monthly cess collections were as follows :—

January	.. Rs.	166,590	Brought forward	Rs.	630,412
February	.. ,,	110,781	July	.. ,,	48,031
March	.. ,,	88,404	August	.. ,,	77,998
April	.. ,,	79,166	September	.. ,,	100,499
May	.. ,,	93,199	October	.. ,,	87,848
June	.. ,,	92,272	November	.. ,,	82,090
Carried forward	Rs.	630,412	December	.. ,,	126,808
			TOTAL	Rs.	1,153,686

A profit of Rs. 78,166/– was derived from the normal working of Dartonfield Group.

Expenditure.—Current expenditure amounted to Rs. 965,868/–. The surplus of income over expenditure for the year was therefore Rs. 616,356/–.

Capital expenditure amounting to Rs. 589,617/– was incurred during the year, the main items being Agricultural Development Rs. 142,297/–, Buildings and Lines Rs. 296,088/–, Power and Water Supply Rs. 25,434/–, Machinery and Tools Rs. 105,056/– and Furniture & Fixed Equipment Rs. 20,740/–.

Accounts.—The accounts for the year together with a Balance Sheet showing the property and liabilities of the Board will be prepared and submitted to the Auditor General for examination.

Technical Reports.—The Director's report, which embodies the reports of other officers, is attached.

(Sgd.) W. P. H. DIAS,
Chairman of the Board,
Rubber Research Institute of Ceylon.

Dartonfield,
Agalawatta.
3–3–1953.

DIRECTOR'S REPORT FOR 1952

By

H. E. Young

The demand for the services of the Institute in an advisory capacity by the industry has increased rapidly and is placing a severe strain on all departments. In the Research Departments this is a factor which must be given careful consideration as the time spent on advisory duties by the Research Officers has reached such a magnitude as to seriously interfere with the advancement of research activities. It is realized that the advisory services are a major and essential duty of the Institute but it must also be borne in mind that sound advice can only be based on research and that without research there can be no progress.

Consideration will therefore have to be given in the near future to the organization of an advisory service with special officers for the purpose in order that both research and extension activities may continue unhampered and that these services research and advisory may be available to the industry on the most efficient level possible without interfering with each other.

It is not regarded as desirable that the research and advisory activities should be entirely divorced from each other because the research officer can only gain the necessary practical knowledge of commercial conditions by close contact with practical planters and business men and the advisory officer besides his contact with the industry needs close contact with the research work on which his advice must be based.

As an example of the recent increase in the work of the institute the following figures in regard to corrrespondence are of interest :—

	1950	1952
Advisory correspondence ..	1,128	3,054
Administrative „ ..	1,811	2,827
	2,939	5,881

The figures do not include the correspondence of the Estate and Small Holdings Departments. Figures for the latter for the same period were :—

1950	1952
6,324	6,648

Of this more than half consists of correspondence with the Rubber Controller.

That is, the advisory work of the technical departments has increased approximately 100 per cent recently. While this is gratifying as it shows that the industry is appreciating and relying upon the advice of the Institute to a much greater extent it has meant the doubling of the work concerned both clerical and technical and the present staff is inadequate to deal with this additional work. The appointment of extra clerical assistance is an immediate necessity.

Senior Staff :—

Dr. H. E. Young, D.Sc., AGRIC., Director, was on duty throughout the year except for a period of three months contract leave.

Mr. D. H. Constable, M.Sc., D.I.C., A.R.C.S., Agronomist, was on duty throughout the year.

Dr. E. J. Risdon, M.A., D.PHIL., A.R.I.C., Chemist, was on duty throughout the year and acted for the Director during the latter's absence on leave.

Mr. C. A. de Silva, B.Sc., C.D.A., Botanist, was absent on 6 months overseas leave from 1st May, 1952 to 31st October, 1952.

Ir. J. H. Van Emden, M.Sc., Holland, Mycologist, was on duty throughout the year and acted for the Botanist during the latter's overseas leave.

Mr. W. I. Pieris, B.A., (Hort.) Small Holdings Propaganda Officer, was absent on six months overseas leave from 1st April 1952 to 30th September, 1952.

Mr. C. D. de Fonseka, A.C.C.A., A.C.C.S., Secretary-Accountant, was on duty throughout the year.

Mr. G. W. D. Barnet, Estate Superintendent, was on duty throughout the year.

Intermediate Staff :—

Mr. D. M. Fernando, B.Sc., Mycology Department, continued his studies at McGill University, Canada, under the Technical Aid Programme.

Mr. A. J. Jeevaratnam, B.Sc., AGR., Agronomy Department, was on duty throughout the year.

Mr. P. W. W. de Silva, B.Sc., AGR., was transferred from the Botany Department to the Small Holdings Department on 15th September 1952, and was on duty throughout the year.

Mr. S. Natesan, B.Sc., B.Sc., AGR., Chemistry Department, resigned from the Institute as from 7th July, 1952.

Mr. N. W. Palihawadana, Senior Assistant Propaganda Officer, Small Holdings Department, was on duty throughout the year and acted as Small Holdings Propaganda Officer during the absence of Mr. W. I. Pieris from 1st April, 1952 to 30th September, 1952.

Mr. K. Wilson de Silva, A.P.O. (South) was on duty throughout the year.

Mr. H. H. Peiris, A.P.O. (North) was on duty throughout the year.

General :

The Director as ex-officio Vice-Chairman served on the Rubber Research Board throughout the year and as a member of the Small Holdings and Experimental Committees.

He served as a member of the Central Board of Agriculture, The Rubber Advisory Board, The General Committee of the Planters' Association, and of the Committee of the Kalutara District Planters' Association.

He was also a member of the Agricultural Industries Committee in connection with arrangements for the Colombo Plan Exhibition and also of the Floral Committee.

The Annual Meetings of the Low Country Products Association and of the Planters' Association were attended and several addresses were given by him to various planting bodies including the Low Country Products Association and various District Planting Associations.

The Director accompanied by Dr. Risdon, Chemist, attended the Conference of Directors and Staffs of Scientific Institutes in the Far East held at Bogor, Java in August and also visited rubber estates and factories in Java, Sumatra and Malaya.

In November the Director attended meetings of the London Advisory Committee for Rubber Research in London and of the International Rubber Research Board and of the Institution of the Rubber Industry. He visited various institutions of scientific interest in the United Kingdom including the Rothamstead Agricultural Research Station, Long Ashton Research Station, East Malling Research Station, The Department of Rural Economy at Oxford University, The Commonwealth Mycological Institute, The Imperial Institute, The Imperial College of Science, The Dunlop Research Centre etc., in the course of discussions and enquiries of benefit to the Ceylon rubber industry.

Buildings :

One intermediate and two assistant staff bungalows were constructed at Dartonfield and a start was made with the remodelling and extension of the factory. Four double cottages at Dartonfield and fourteen at Hedigalla for labourers were completed.

Improvements were carried out to assistant staff bungalows at Dartonfield, Nivitigalakele and Hedigalla by the provision of indoor sanitation. Other work as detailed in the various departments' reports was carried out on buildings, machinery, water supply etc.

Planting :

35 acres of old rubber were cleared at Dartonfield and the area replanted in connection with field experiments.

75 acres of jungle were cleared at Hedigalla and planted in connection with field experiments.

The present acreage under rubber in the three divisions is 546 acres.

32 acres are occupied by buildings and roads and 735 acres of jungle at Hedigalla remain for extension purposes.

The labour force for the year reached a total of 571.

The salaried staff Senior, Intermediate, Assistant and Minor totalled — Senior 8, Intermediate 7, Assistant 69, and Minor 25.

137,008 lbs. of rubber in various forms were manufactured in the factory during the year from the crop from the various divisions.

Publications :

During the year the following publications were issued :—

Advisory Circular No. 1 — Notes on Budgrafting Procedure (Revised)

Advisory Circular No. 12 — Warm Air Drying House (Reprinted)

Advisory Circular No. 21 — The Control of Bark Rot and Canker (Revised)

Advisory Circular No. 31 — Root Disease in Replanted Areas.

Advisory Circular No. 32 — Crown Budding for Oidium Resistance.
Advisory Circular No. 33 — Mechanical Felling of Rubber.
Advisory Circular No. 34 — Tapping Systems.
Advisory Circular No. 35 — Notes on Rubber Seedling Nurseries.
Combined 1st and 2nd Quarterly Circular — 1951.
Combined 3rd and 4th Quarterly Circular — 1951.
Report of the work of the Rubber Research Board 1951.

Contributions were made by the Director and members of the Staff to publications by other bodies.

Visitors :

Overseas visitors to the Institute included :

Mr. T. B. Paltridge, Senior Research Officer, Division of Plant Industry, Canberra.

Dr. E. Rhodes of the British Rubber Producers' Research Association, London.

Dr. Neville White, Lecturer in Mycology, University of Sydney, Australia.

Dr. R. G. Newton of the International Rubber Research Board.

The numbers of planters visiting the Institute for advice and general discussion and demonstration has increased during the year. Numerous visits were also received from technical officers of commercial organizations.

Demonstrations :

The Rubber Research Institute was mainly responsible for the erection and provision of exhibits for the Rubber Section of the Colombo Plan Exhibition and staff was provided continuously during the exhibition for explanatory and demonstration duties. The stand received considerable attention, the main attraction being an electrically operated scale working model of a crepe rubber factory which was built by the engineering staff of the Institute at Dartonfield. The Small Holdings Department provided scale models of smoke houses, etc.

In this exhibit the co-operation of the Planters' Association of Ceylon, The Low Country Products Association and the British Rubber Development Board both financially and in the work concerned was greatly appreciated. The last body provided an attractive and educational exhibit depicting the manufacturing side of the rubber industry which was supervised by Dr. Edgar Rhodes a former Director of the R.R.I.

Field demonstrations in sulphur dusting techniques were given during the year by the Mycologist at various points in the rubber growing districts.

Departmental Reports :

A summary of the work of each department for the year as prepared by the relevant officer in charge is given hereafter under each departmental heading.

Research Laboratories,
Dartonfield,
Agalawatta
16–3–53.

REPORT OF THE CHEMIST FOR THE YEAR 1952

By

E. J. Risdon

Section 1 — General :

1. Staff.—The Chemical Department now consists of the Chemist, the Research Assistant Mr. M. Nadarajah, B.Sc., (Ceylon) graduated 1946, three Laboratory Assistants Messrs. D. S. Muthukuda, M. T. Veerabangsa and G. G. Gnanasegaram and one Peon. Mr. S. Natesan, B.Sc., Research Assistant resigned from the Institute with effect from the end of the first week in July and proceeded to the Department of Agriculture. Mr. M. Nadarajah was appointed to the Department by the Rubber Research Board and commenced duty on December 15th. Mr. Gnanasegaram was appointed to the Department by the Director and commenced duty on 3–11–52. With effect from January 1st 1953 the Peon will be graded Attendant and a Peon appointed on probation. Attempts to obtain the services of a Specialist Laboratory Assistant failed as the Officer recommended to the Director on the grounds of qualifications and experience eventually preferred to continue in Government Service.

The table below shows the working days of absence by the various members of the Department during the year together with the period of duty :—

By	*Casual Vacation Leave*	*Illness*	*Total Days*	*Period of Duty Months*
Chemist	13½	1	14½	12
Research Assistant (S.N.)	15	33	48	7.2
Research Assistant (M.N.)	—	—	—	0.5
Laboratory Assistant (D.S.M.)	28	12½	40½	12
,, ,, (M.T.V.)	19½	6	25½	12
,, ,, (G.G.G.)	2	2	4	1.9

The resignation of Mr. Natesan in July meant that a considerable part of his time had to be engaged writing up his work in detail for record purposes. The Chemist acted for the Director during his absence on leave from March 27th to June 26th. This involved some reduction in the time that the Chemist could give to the Department during the three months in question.

2. Advisory Services.—The volume of advisory work is again considerable. A very large part of the Chemist's time is taken up with correspondence relating to the Advisory Services, as well as with the technical literature. The volume and range of samples submitted for comment or analysis is also greater than in 1951.

Samples submitted for Tests or Reports (Unsolicited)	105
Visitors to the Department ..	64
Total Letters outgoing, excluding Roneoed Letters and Pamphlets ..	615
Roneoed Letters, Pamphlets and Reports ..	10
Visits by the Staff of the Chemical Dept. (Details below)	95

By	*To R.R.I.C. Estates*	*To other Estates*	*Other Visits*	*Total*
Chemist	15	18	23	56
Research Assistants	2	2	2	6
Laboratory Assistants	23	2	8	33

The figures in the second column refer only to experiments started with latex before its arrival at the factory. Visits to outside Estates normally require the preparation of a detailed report on certain aspects of the processes followed. Where appropriate the services of the Staff of Estate Department *e.g.*, the Rubber Makers are utilised with the co-operation of the Estate Superintendent. The Chemist participated in a number of the discussions on the extensions and new equipment of the factory by Estate Department.

3. Miscellaneous.—Members of the Department contributed to the Rubber Industry stand at the Colombo Plan Exhibition by the collection and preparation of some samples and by attendance at the Exhibition on duty. Messrs. Hayley & Kenny Ltd. of Colombo and Messrs. The Latex Corporation of Ceylon supplied certain samples to assist the Department.

The Chemist and a Laboratory Assistant took stock in the Mycology Department and the Laboratory Assistant aided members of the Botany Department to take stock in the Chemical Department. These two operations, required for Government Audit purposes, involved about a week of the Laboratory Assistant's time.

The publications of the Department during 1952 included the Report of the Department for 1951 and two articles submitted to the Editor of the Quarterly Circular. A further article is in preparation. Acknowledgment is made to the officers of the London Advisory Committee for Rubber Research (Ceylon and Malaya) for assistance in various matters.

The Conference of Directors and Staff of the Far Eastern Rubber Research Institutes held in 1952 at Bogor, Republic of Indonesia, and sponsored by C.P.V. and I.N.I.R.O. was divided into two distinct sections — Agricultural and Chemical–Technological. The Sections held their meetings separately and the Chemist was directed to accept the invitation to the Chemical–Technological Section. The Chemist also accompanied the Director on his subsequent visit to Sumatra. A report has already been submitted to the Board and Director by the Chemist (Circulation Paper No. 1703).

Section II Latex :

1. Equipment.—More of the equipment and apparatus required for work in this section, including the Dunlop Klaxon mechanical stability tester and the pH meter, arrived during the year. Unfortunately the pH meter galvanometer was slightly damaged in transit but has been repaired at the Institute temporarily, so that the pH meter can be used when the galvanometer is clamped upside down. The small size 2″ × 4″ laboratory mill, ordered for the Department partly in connection with work in this section has not yet arrived, and the experimental d.r.c. mills in the factory, also used in connection with the test tapping for the Botany Department, had to undergo extensive renovations. The Beckman spectrophotometer with flame attachment ordered for the Department (Circulation Paper No. 1689 p. 5) has not yet been received.

2. Determination of the d.r.c. of Ammoniated Latex.—The investigation into the subject of the choice of acid strength, as permitted in B.S. 1672 : Part I : 1950 for the determination of the d.r.c. of freshly ammoniated latex has been referred to previously (1951 Report p. 6), and has now been completed and written up in a form suitable for submission to the Editor of the Quarterly Circulars.

The object of this work is to decide whether modification No. 1.33 of B.S. 1672 : Part I : 1950 p. 9 for freshly preserved latex which includes the paragraph ' It is permissible to coagulate the amount of latex specified above with

up to 150 ml of 0.5% acetic acid (v/v) instead of up to 80 ml of 2.0% acetic acid v/v,' is strictly suitable for Ceylon. The first series of tests in 1951 comparing the use of 5%, 2% and .5% acid suggested no significant differences between test methods in comparison with the 'samples × methods' interaction, although the .5% acid gave the lowest mean d.r.c. figure. In a second series of tests in 1952, 8 samples of Dartonfield latex were examined for d.r.c. in triplicate by the 2% and .5% methods after 20 hours and again after 4 days storage as ammoniated latex. In this case the difference between methods appears significant, in comparison the 'samples × methods' interaction, at P = .05 but not at P = .01 — the .5% acid giving the higher figures. The interaction 'samples × methods' appears to be significant in comparison with second and higher order interactions considered together as remainders, and this is at present interpreted to mean that while the .5% acid method as preferred by one buyer of ammoniated latex will not generally give significantly lower d.r.c. values, the samples nevertheless appear to show evidence of a differential response to the two methods of test. No evidence of a significant 'methods × times of storage' interaction has been found indicating no apparent need to consider one procedure for one period of storage and the second at, say, the longer storage period.

The conclusion drawn is that of the possible acid strengths permitted in B.S. 1672 : Part I : 1950 : there is no reliable evidence to suggest that the 0.5% acetic acid v/v is unsuitable. The matter is of some importance to Estates selling ammoniated latex to organisations (engaged in the concentration and export of latex), which buy the ammoniated latex on the basis of the d.r.c. as received.

3. Effect of Ammoniation on the d.r.c. of Latex.—This investigation started in 1951 (1951 Report pp. 6) and has been completed in 1952. The sale of latex by a considerable number of Estates to non-planting organisations with facilities for latex concentration in one of the main low country planting areas or in Colombo is a comparatively recent large scale development in Ceylon. Since payment for the latex is made on the basis of the total dry rubber in the latex as received and determined by the buyer and since the Institute acts as arbitrator in case of disputes, the problem of the effect of ammoniation and of short term storage on the d.r.c. of the latex was eventually brought to the Institute. One Agency House suggested that a difference of at least 1% between the d.r.c. of fresh and ammoniated latex might be observed, implying that a difference of this order might be found within a few days of ammoniation.

Whilst there is information in the literature showing a substantial decrease in d.r.c. on prolonged storage the data are scarcely in agreement with the suggestion of the previous sentence. Nevertheless it was considered desirable to investigate the matter with Ceylon latex.

A summary of part of the experimental data is available in the 1951 Report and of the remainder in the Report for the first half of 1952 (Circulation Paper No. 1689 pp. 6–7), and the whole has now been written up in a form suitable for submission to the Editor of the Quarterly Circulars. It is therefore undesirable to do more than point out that the data did not lend support to the view that the d.r.c. of fresh latex rapidly and significantly decreases in the 3–5 day period following ammoniation. While the experimental data only apply to the samples tested, the implication is that Estates would not, in general, be expected to lose financially by selling latex on the basis of its total dry rubber content as received by the buyer instead on the basis of its fresh total rubber as 'tapped', provided of course there is no undue delay in delivery and testing. Minor discrepancies or losses due to imperfections in the analytical procedures employed must be expected from time to time, but major discrepancies should

be comparatively rare especially if the latex is not homogeneous in origin. Discrepancies can occur as there is evidence of a differential response by the latex to the times of testing after ammoniation, but from an examination of the methods employed at some Estates to determine the d.r.c. of fresh latex a much more likely cause is the imperfection of the methods used.

4. Calculation of d.r.c. from the observed Total Solids (t.s.).—While the British Standard Institution's d.r.c. method for freshly ammoniated latex and our normal procedure for fresh latex require a considerable lapse of time to complete, the total solids determination requires only about 2 hours (B.S. 1672 : Part I : 1950 p. 7). The suggestion that the t.s. might be used to calculate the d.r.c. of latex has occurred in the literature. Neither the standard B.S.I. procedure for t.s., which involves only weighing and heating, nor the modified 'omelette' method whereby the heating time is greatly decreased by supporting the latex in a dish over an open flame or parrafin burner appears to have received much attention in Ceylon.

The literature clearly suggests that the value of the correction factor K in the expression d.r.c. = K × t.s. may vary from Estate to Estate, but little published data on the numerical value of the variation of K has been observed and none relating to Ceylon. In an experiment on this subject samples of latex from Dartonfield slaughter tapped old seedling and from Dartonfield budded trees have been selected and ammoniated to 0.0%, .5% and .7% ammonia content prior to estimating the d.r.c. and t.s. in triplicate on the fresh latex and on the ammoniated latex at about 1,24 and 96 hours after ammoniation. The appropriate K value is found by dividing the mean d.r.c. by the mean t.s. and the range of K values is .885 to .935. The first provisional analysis of variance of the type 'X samples × Y treatments,' suggests that the differences between treatments and samples are significant at P = .01 in comparison with the first order interaction. This is at present interpreted to mean that the numerical value of K might differ significantly within as well as between Estates in Ceylon.

The matter is of some importance should buyers of ammoniated latex wish to use this test procedure, as it seems clear from the data that payments made to Estates on the basis of a t.s. figure for ammoniated latex should only be accepted after considerable exploratory data. Experiments designed to ascertain whether there is a day to day variation in the K value of latex obtained from a relatively uniform source, such as a tapper's task or a monoclonal block, are in progress.

5. Approximate Determination of the d.r.c. of Fresh latex.—Methods for the approximate determination of d.r.c. are normally required to estimate the production of the individual tapper for payment and task yield purposes, for calculations with regard to standardisation, addition of bisulphite, acid etc., and to estimate the actual input of rubber to the factory. In general the more accurate the estimate of the d.r.c. the better, provided the procedure adequately balances the accuracy with the expense involved irrespective of whether the latter be measured in terms of equipment etc., costs or in terms of the time required by relatively skilled personnel or in terms of both. In this connection it is worthwhile stressing that an accurate determination of the actual daily input of rubber to the factory and of the annual output of new clearings might well be worth considerable trouble and expense. At least this is the opinion of those concerned with certain other agricultural industries *e.g.*, the sugar industry where factory input etc., is often measured with considerable care. Nevertheless, it is pointless to estimate the % d.r.c. of latex accurately if the level of accuracy of the weight of the latex is not of the same order.

In Ceylon the hydrometric method, *i.e.*, metrolac etc., is still widely used, although it is apparent that some Estates are no longer fully satisfied with its performance. Not unnaturally the question of 'shortages' seems from the correspondence to be most acute with Estates selling ammoniated latex. In 1947 H. Fairfield Smith of the R.R.I.M. reviewed (J.R.R.I.M. 1947 *12* 47–61, Comm. No. 263) the subject in some detail, pointing out that in Malaya (Eaton scale) the average bias of a set of observations (*e.g.*, of tapper's returns) may be adjusted on the basis of factory output, but appropriate agreement between factory output and latex volumes (or weights as appropriate) × metrolac figures gives no check of the reliability of individual readings. The weights of rubber brought in by an individual tapper may be over or under-estimated by about 3% per unit d.r.c. difference between his original latex as tapped and that of the average of the batch. Discussing means of improving the method, Fairfield Smith concludes that, if the latex brought for measurement contains unknown amounts of water, it is difficult to see how the procedure may be improved and that on Estates with a wide range of clones and ages the error inflicted on whole groups of tappers could approach 20%.

Reference to the early literature of the hydrometric method clearly explains how inaccuracies can arise, but nevertheless it appears to be the opinion of some planters that the O'Brien scale metrolac is quite adequate for old seedling rubber. In the case of Ceylon budded rubber latex the position is not so clear, and since the degree of accuracy required is governed by the use to which the reading is put, a number of new tests comparing d.r.c. by the metrolac and d.r.c. by coagulation have been carried out partly by Estate Department and partly by the Chemical Department. The d.r.c. by coagulation has been estimated by the trial coagulation procedure (Advisory Circular No. 17, 2nd supplement) whereby 50 ml of latex are coagulated with acid, milled thin the same day and dried overnight in a warm air drying tower prior to weighing the next day.

In the first series the d.r.c. by trial coagulation and by the metrolac has been estimated on the output of 12 budded rubber tappers at Dartonfield for a period of 35 tapping days in May–June 1952. The data in terms of lbs./gallons in the analysis of variance table below refers to the difference d.r.c. by coagulation minus d.r.c. by metrolac and not to the total rubber in lbs.—

Source of Variance	*Deg. of Freedom*	*Variance*	*F(TXD)*	*F(D)*
Between Tappers (T)	11	.419	9.98**	2.703*
Between Days (D)	34	.155	3.69**	—
T × D	374	.042	—	—

The table suggests that the numerical values of the various differences (in lbs. of rubber/gallon of latex) between the d.r.c. by trial coagulation minus the d.r.c. by metrolac differ significantly between tappers and days in comparison with the first order interaction.

In a second series of tests involving 11 budded rubber tappers at Dartonfield over a period of 46 days in July–Augtust 1952 the corresponding figures are :—

Source of Variance	*Deg. of Freedom*	*Variance*	*F(T×D)*	*F(D)*
Between Tappers (T)	10	1.016	28.22**	8.68**
Days (D)	45	.117	3.25**	—
T × D	450	.036	—	—

Here also the differences between tappers and between days appeared significant in comparison with the first order interaction. In this case the standard deviation of the d.r.c. differences between tappers is larger.

The possibility that a large number of these tests have been insufficiently accurately performed has been checked by taking other samples of the latex before, during and after the period of the above experiments and estimating their d.r.c. by the metrolac and by trial coagulation using different operators. In these latter tests the weighings and measurements of volume were more reliable. For these series of tests the standard deviations of the total population of differences were of the same order, and it is concluded that the figures of the above 2 tables are reasonably reliable with respect to the latex involved. If the bias of the metrolac is removed and the data obey, for example, the normal distribution it is possible to use the appropriate standard deviation to make certain deductions (on the basis of these figures) concerning the suitability of the metrolac for the particular budded rubber latex involved. More properly this is beyond the scope of this report and should form part of a review in the Quarterly Circular. However making a number of comparatively reasonable simplifications or assumptions, it seems possible to show that the data are in agreement with the views that :—

1. Metrolac readings can be made reasonably suitable for determining the approximate d.r.c. of the bulk of a large number of tappers latex for purposes such as estimation of the weights of bisulphite, RPA. 3 etc., required for the bulk.

2. Metrolac readings used to calculate a tapper's daily, monthly or annual total rubber output can readily be grossly in error. Thus, if for example the average tapper's output is about 1,000 lbs., then 1 in 3 tappers could be over or underestimated by at least 50 lbs. dry rubber, 1 in 20 tappers could be incorrectly estimated by at least 100 lbs. dry rubber, and 1 in 370 tappers by at least 150 lbs. Provided the metrolac is not biased the inaccuracy implies that, in general, certain tappers will be over estimated at the expense of other tappers and not at the expense of the Estate or vice versa.

As far as the Institute is aware these conclusions, which only apply reasonably certainly to the samples considered, are substantially those of the R.R.I.M., although recent extensive data for a large number of tappers and days has not yet been observed for Ceylon budded rubber latex. In the foregoing account it has been assumed that the trial coagulation procedure gives an accurate measure of the true d.r.c. A limited number (21 observations) of tests suggest that the use of weights instead of volumes of latex and of more careful drying etc., may increase the average d.r.c. by about .1 lb./gal. above the trial coagulation figure with a standard deviation of about .06 lbs./gallon. At present it is considered that improbable that the values are likely to interfere seriously with the conclusions above.

While O. de Vries in 1920 (Estate Rubber pp. 108–9) pointed out that the only sure way known at present to determine the rubber content of latex is actual coagulation of the latex and weighing the rubber, the procedure of trial coagulation as mentioned above (Advisory Circular No. 17 2nd Supplement) is not universally employed in Ceylon. The criticisms of the method include (1) it presupposes the presence of mills capable of rolling coagulum thin enough to dry overnight in a normal tower (2) it involves the use of accurate scales and (3) it requires too much of the time of a relatively responsible member of the Estate's staff. It appears that (1) can be partly overcome by using a bottle full of water for milling (as has been suggested in Malaya), although it seems difficult to obtain the lace thin enough to dry overnight in a standard drying tower. The size and type of scales required is largely a matter of the accuracy intended

together with the weight of material used. For estimates of the d.r.c. of a large bulk of latex at a normal Estate there is no reason why the d.r.c. sample employed could not be in terms of gallons instead of 50 millilitres (about 2 ounces). This modified procedure, *i.e.*, larger weights of latex, is scarcely suitable for estimating tappers daily output. The criticism that too much time of a relatively responsible individual is required probably arises partly because the volumes of latex and weights of rubber involved are small hence each operation *e.g.*, measuring, milling and weighing has to be carefully watched to avoid errors. One Superintendent pointed out that simplification results if the daily biscuits are stored for a time before being milled together to obtain the average % d.r.c. over the period involved, and this suggestion has been investigated in more detail at the R.R.I.C. under the title of the Aliquot Sampling Method.

In the Aliquot Sampling Method the daily biscuits resulting from the coagulation of a sample of the tapper's latex are stored, in air (or under water) after slight hand pressing, until the biscuit from the fifth day of the batch is available, when all are properly milled together as 1 sample prior to drying and weighing. Alternatively, since there is evidence that the d.r.c. of ammoniated latex does not always greatly decrease over the storage period 3–5 days after ammoniation, it should be possible in many cases to store the daily sample of latex for 3–5 days before coagulation of the whole or a subsample. One obvious objection to this procedure is that the size of the daily sample cannot always be the same unless the weight of latex brought in by the tapper is invariably constant. In the laboratory the aliquot proportion used is 2 millilitres per 1 lb. of latex brought in by the tapper (*i.e.*, 100 ml for 50 lbs. of latex) and at the end of 5 calendar (not tapping) days the biscuits are milled or the ammoniated latex (0.5% ammonia content) coagulated. The % d.r.c. of the subsample should then be equal to the average % d.r.c. of the tappers output over the 5 calendar day period, from which the total dry rubber content may then be calculated. The aliquot proportion of the subsample may of course be varied as required for simplicity. The procedure briefly described above has not yet been exhaustively investigated but appears from the data available to have a far lower error than is found with the metrolac.

It appears from the correspondence that certain Estates measure their daily total input figure either by coagulating a subsample and weighing this almost immediately after milling or by weighing the whole production very shortly after milling and using a factor between 80 and 85%, usually 82–84%. The exact procedure is not precisely described and it is to be supposed that the factor will not always be entirely reliable. Experiments designed to throw information on this point were carried out by collecting latex from different areas on different days, milling the coagulum the next morning and allowing 3 large subsamples of 2 laces per day to hang after slight shaking in the natural air drying loft or in the warm air drying tower for periods of 0.5. 2, 6, 24 and 48 hours prior to weighing. At the end of the 48 hours portions of the subsamples are dried at 70°C and the data used to calculate the % d.r.c. at the various times. In the loft the standard deviation of the mean of three subsamples of each lace about the overall mean falls to nearly .1% d.r.c. in 24 hours and is even less at 48 hours ; the mean figures of the % d.r.c. for these 2 times are not statistically different. When the dripping takes place in the natural air drying loft (no fans) the standard deviations at 24 and 48 hours are considerably larger. At 0.5 hours dripping time the overall mean d.r.c. in the loft was 85.5% and in the tower (warmed air) 85.9%, with a standard deviation of over 2.5% in (air temperature) loft.

Section 3 : Smoked Sheet :

1. Advisory Problems.—In the early part of the year the advisory problems in relation to smoked sheet were mainly concerned with the prevention of bubble formation, of precoagulation and of enzymatic discolouration.

During the latter part of the year the number of letters with regard to drying and smoking increased. It is regretted that very little active research on smoked sheet could be carried out due to the lack of suitable modern equipment for making smoked sheets ; with the delivery of the Guthrie type mill and the erection of the experimental smoke house, this situation should not arise in 1953.

2. Packing R.S.S.—There is little information to add to that given in the 1951 Report. Packers in Ceylon tend to leave the Institute with the impression that there are few complaints from Europe or America about Ceylon R.S.S. on this score, possibly because Ceylon R.S.S. is packed on top of other cargo. Some evidence in support of this view has been received from other sources, although R.S.S. bales in general (*i.e.*, without special reference to Ceylon) are at times very badly distorted on arrival at destination. It should be recorded however that some of the bales held in stores awaiting shipment to Asian ports were distorted, and that few of the packing stores visited have the equipment considered necessary in other countries to minimise bale distortion in transit.

Through the hospitality of the proprietors and managers, the Director and Chemist (while en route to Bogor) were permitted to visit 2 Singapore packing houses in July.

3. Mould on R.S.S.—As a result of requests by Colombo Packers work on this subject commenced in 1951 (1951 Report p. 8), and the data obtained suggested that dipping old washed R.S.S. in p. Nitrophenol could be superior to resmoking in the prevention of the reappearance of mould under drastic testing conditions.

Tests on a limited number of imported fungicide received in 1952 have commenced but so far not one has been found to be substantially superior to p. Nitrophenol, when used as dipping agents for washed R.S.S. Further details on some of these fungicides may be found in Section 4 item No. 1 of this report.

4. Smoking and Drying Sheet.—The present old R.S.S. type smoke house is being converted to a warm air crepe drying tower and a new experimental smoke house has been authorised by the Rubber Research Board (Circulation Paper No. 1689 p. 9). The smoke house is being built to R.R.I.C. specification by a Colombo engineering company and there have been a number of interviews with the engineers of the building company. Unfortunately, although the blue prints for the first design are available, the building is not yet completed.

The experimental smoke house is to be used to investigate the conditions governing the proper smoking and drying of sheets and to ascertain whether the high proportion of mouldy R.S.S., 2, 3, 4 and 5 received by some Packers can be reduced by improved drying. The sheets from the smoke house will also be available for experiments designed to assist in the prevention of mould after packing.

Section 4. Blanket and Sole Crepe :

1. Mould on Crepe.—The early publications of the Institute and of other organisations suggest that blue, black, violet, green or red spots can arise as a result of fungal attack, but that with proper attention to process and storage details during and after manufacture no symptoms of the attack should be visible. For the period of the second monsoon of 1951 and early in 1952 Estates were invited to send to the Institute samples of mouldy laces and crepes. From the correspondence as a result of this request it is apparent that at certain times

the volume of mouldy material in Ceylon and probably elswhere is not insignificant. Representative portions of a number of these samples were submitted to I.C.I. (Export) Ltd., Colombo, for transmission to Manchester. The Institute has now been supplied with a list of nine of the microorganisms capable of producing a stain in the samples.

Since the optiminum conditions for mould growth seem to include high water vapour content in or near the samples, an investigation on the suppression of mould requires, for example, consideration of the means of ensuring a reasonably low overall moisture content on leaving the factory and perhaps the incorporation of a non-deleterious fungicide, added primarily to protect the material against mould as a result of exposure to conditions favourable to mould growth after leaving the Estate. From the correspondence cases of mould growth arising as a result of carelessness in shipment are not infrequently the cause of the trouble.

Experiments concerned with the drying and the moisture content of laces are outside the scope of this subsection. Experiments involving the incorporation of varying concentrations of imported fungicides have continued in 1952. The procedure normally employed is to add the fungicide with dispersing or emulsifying agents, as required, to the latex before addition of the acid. The resulting coagulum is milled and finished as sole crepe. Samples of this crepe are stored in a desiccator over water and in two other places. Whilst exposure to water vapour in a desiccator is considered a drastic test, it's inclusion is considered justified by the facts (1) that the incorporation of damp laces in the centre of thick sole crepe may give rise to stains and (2) that the accidental wetting of a box of sole crepe by rain or sea water in considerable volume (*e.g.*, in badly controlled loading conditions in the harbours) can give rise to conditions favourable to staining. The fungicides tested include p. Nitrophenol normally used as one control, Milban D a dithiocarbamate with added dispersing agents, I.N. 2555 a phenyl mercury oleate composition in mineral solvent, Tillex a relatively cheap mercury based fluid primarily intended as a seed dressing, Shirlan N.A. a readily dispersed paste based on salicyl anilide, Vulcastab D.D.M. an alkali soluble compound whose composition has not been officially disclosed by its suppliers I.C.I. (Export) Ltd., Colombo and Dehydroacetic acid.

Assessment of the mould suppresant power of these chemicals is at present made by noting the approximate time in days for the first appearance of appreciable mould on the specimen. This procedure does not necessarily give extremely reproducible figures, but it has the merit that it is a near approach to the commercial procedure. On this basis the chemicals would (from the data at present available) be tentatively arranged in increasing order of efficiency very approximately as :—

1% Dehydroacetic Acid, 1% Shirlan, 1% I.N.2555, .1% p.Nitrophenol, $\left.\begin{matrix}1\%\text{ Milban D}\\1\%\text{ Vulcastab DDM}\end{matrix}\right\}$, 1% p.Nitrophenol.

1% p. Nitrophenol gave apparent freedom from visible mould over at least 100 days in the desiccator. As is well known p. Nitrophenol is not considered suitable for crepe owing to the risk of discolouration: the rate of discolouration appears in these tests quite slow in the desiccator if the sample contains only .1% p. Nitrophenol, but the discolouration appeared to increase with higher concentration of the reagent or when the samples were exposed to diffuse sunlight. Milban D is not considered suitable for blanket crepe sold for vulcanisation purposes, and has an effect on the colour of sole crepe giving it a whitish but slightly opaque ' dead ' appearance, which may be unacceptable. In

small scale experiments Vulcastab D.D.M. tends to interfere with the ' smooth ' coagulation of the latex producing streaky or slightly discoloured material, but it may be possible to overcome this defect in large scale tests. The Institute is in touch with the manufacturers of this material with regard to its availability, effect on Vulcanisation and on the properties of vulcanised rubber etc. I.N. 2555 did not show up well in these tests probably due to the lack, until recently, of facilities for its proper dispersion in water prior to addition to the latex.

The programme for 1953 requires further small scale tests on some of the above chemicals and on a number of others which have only recently been received, prior to certain larger scale trials with boxes of finished sole crepe.

2. Lamination of Sole Crepe. --This investigation into the cause of the difficulty observed in the lamination of sole crepe laces at certain Estates principally in the Matale area, has continued in 1952. Unfortunately it was not possible to give this subject much attention particularly whilst the post of Research Assistant was vacant from the mid year until the middle of December. In 1951 it was suggested (1951 Report pp. 11, 12) that the quality — chemical or microbiological — of the water used on the last smooth mill might be one of the important factors. The Institute has been informed that all the Estates with this difficulty which have arranged experimentally to put fresh rain water on the last smooth mill no longer needed to use a hot table for lamination of the experimental laces. This conclusion has been partly confirmed in principle by limited small scale experiments at the Institute in which R.R.I.C. laces were dipped in the waters from some of the Estates for various times prior to drying and laminating.

A limited number of partial analyses of the milling water used at various Estates suggests that the difficulty is probably related at least in some cases to the proportion and type of Calcium compounds in the water. It has been pointed out in London that it is difficult to see how small quantities of Calcium etc., can interfere with the lamination when the proportion in the original latex is not insignificant. Nevertheless soaking experiments whereby 1 pound of sole crepe laces were soaked in 1 gallon of various solutions prior to drying and lamination have *so far* supported the above conclusions. The most striking feature of one of the experiments was the difficulty of laminating laces previously soaked in water containing over about 20 p.p.m. of calcium added as carbonate and taken into solution by bubbling carbon dioxide into the mixture. About 80 p.p.m. of calcium added as chloride had less effect. This laboratory soaking procedure appears to be at least some guide to factory behaviour as tests with water from various Estates have so far shown a similar type of behaviour in the laboratory and in the factory. Estates wishing to have their water tested on this basis have therefore been advised to be prepared to offer samples of upto 4 gallons.

Experiments to date do not conclusively suggest whether the difficulties under consideration are the result of a selective process taking place in the presence of certain ions or ion combination or whether the behaviour is a result of a pH effect or both. This aspect of the subject could not be investigated in detail as the pH meter did not arrive sufficiently early, however the preliminary results so far obtained with buffered solutions and with buffers added to ' defective ' water appear to be in agreement with the view that high pH water, possibly arising in some cases from bicarbonate alkalinity, can under certain conditions be undesirable. This subject is on the 1953 programme.

3. Bleaching by R.P.A. 3.—This process was originally introduced in Ceylon as a result of information supplied by the R.R.I. of Malaya and work on this subject has continued throughout the whole of 1952. The subject is

now in the process of being written up in a form of a progress report intended for submission to the Editor of the Quarterly Circular with a view to publication. For this reason the information given in this report will be limited.

In the first half of the year a questionnaire was sent to Estates through the Agency Houses asking *inter alia* for the Estate's opinion on the process and for information on their difficulties. Whilst it was noticed that few replies were received from Estates controlled by certain Agency Houses a total of over 50 Estates did furnish valuable comments and opinions. Many of these Estates appeared to have no difficulties at all, whilst others could be given some advice by return post. Later in the year the Institute was approached by representatives of the Packing organisations with a request for information concerning whether the process was likely to have a deleterious effect on the long term behaviour of Ceylon blanket and sole crepes. As a result of this query the Chemical Department summarised portions of its views on the use of R.P.A. 3 in a 5 page circular distributed early in November to Estates through Agency Houses, to the Planters' Association and to the Low Country Products Association.

The circular mentioned in the previous paragraph was written primarily with the intention of assisting and advising Estates against the production of crepe likely to develop certain undesirable properties, (compared to unbleached crepes), on storage. Estates have been advised not to use old emulsion. The optimum proportion of R.P.A. 3 to Duponol OS in the emulsion is being re-investigated at present. Further evidence is available to suggest that the minimum proportion of R.P.A. 3 should be employed, preferably but perhaps not always necessarily, with a (small) fraction. The softening effect of R.P.A. 3 on Ceylon sole crepe has been demonstrated by measurements of M 50 (by the London Advisory Committee) on crepes as received and after various different storage treatments. The samples tested were made at Dartonfield with 0 to 2½ lbs. of R.P.A. 3 per 1000 lbs. of rubber. Attention has been given to the subjects of the influence of reduced proportions of bisulphite, the use of stale latex and the conditions for drying bleached laces. Stale latex containing appreciable quantities of ammonia as preservative has not so far been found suitable for bleaching by R.P.A. 3. The question of how far the use of excessive ammonia on wet days interferes with the production of good quality bleached crepes is still under investigation.

As far as possible the advice given to Estates on the use of R.P.A. 3 has been consistent with the view that until the chemistry of the reactions between R.P.A. 3 and the various components of latex is fully understood, the information given by the Institute can only be regarded as referring to the particular latex employed in the experiment. On this basis Estates have been advised to preserve an experimental approach and not to accept any process or change in procedure without proper trials.

4. Disposal of Factory Effluents.—A limited number of Estates, actually crepe producing Estates, have requested the Institute to supply advice on how to prevent their factory effluent giving rise to offensive smells. The matter is particularly acute in the case of at least one Estate, whose main factory is located inside the urban limits of a town in Western Province and whose main drainage ditch becomes almost, if not entirely, stagnant during the mid-year dry season. The problem is likely to be raised by other Estates short of water in the dry season or unable to discharge their effluent into large fast flowing rivers.

The disposal of factory effluents is not a subject with which any member of the scientific staff could claim appreciable previous experience, and no extensive literature on the subject with reference to raw rubber factory effluents

was found at the time the problem was put to the Institute. Correspondence with the various authorities in the U.K. failed to give any useful information until after the date of the resignation of Mr. Natesan, Research Assistant, who was working on the subject. In the interval when the appointment of Research Assistant was unfilled, further literature became available and a more detailed programme for 1953 could be drawn up. It seems appropriate to acknowledge here the assistance and advice given to the Institute by Dr. Southgate, the Director of the Water Pollution Research Laboratory of the D.S.I.R. of the United Kingdom.

5. Drying of Laces.—Pending the construction of the experimental smoke house and drying chamber authorised by the Rubber Research Board, experiments have been started in 1952, principally with sole crepe laces, to obtain some of the necessary background data. Whilst some of these experiments are mentioned in this subsection, it should be understood that in most cases the conclusions are only interim or tentative ones based on incompleted programmes.

The first requirement is consideration of the procedure to be followed to determine the moisture content of sole crepe (*i.e.*, thin) laces. Previous data (Circulation Paper No. 963 *et al*) has suggested that although drying over an efficient desiccant such as sulphuric acid is the ideal, drying at 70°C in an oven is more practical. The graph of loss in weight against time at 70°C has not been found to be smooth and above about 10 to 12 hours there frequently appears to be a further detectable change in weight. For this reason thin laces are preferably dried for 6–8 hours at 70°C and it seems questionable whether the procedure of drying overnight at 70°C is invariably suitable for our conditions, although the differences between 6–8 hours and 16–18 hours is often quite small. Heating lace samples, previously dried over sulphuric acid to apparent equilibrium, often leads to further slight loss in weight. Tests (35 sets of readings) by one operator comparing the moisture content of samples of single laces by heating for 8 hours at 70°C and by drying over sulphuric acid actually showed that the differences were not significant, even at $P = .05$. Although the original laces sampled were classed as dry by ' Estates Procedure ' and the pairs of subsamples were taken close together from the laces, it is considered that the failure to observe differences in moisture content by the two methods may be due to the difference between portions of the same lace. Estimation of the numerical value of the difference between the 2 methods seems to require preconditioning of the test specimens at a fixed humidity and temperature, and this is in progress. For the present it is concluded that drying thin (fresh) crepe laces at 70°C is quite satisfactory at least for the purposes in mind, and that the more complicated techniques of aquametry may be unnecessary. Experiments with standard thickness sole crepes are in progress.

The second requirement is to decide what constitutes a dry lace or what is the maximum permissible moisture content in a dry lace. As far as is known at present, one of the principal requirements of the consumer is that he shall be sold the minimum amount of water for which he has to pay the current rubber price. Similarly the major requirements of the producer in this respect seem to be (*a*) that his sole crepe laces shall laminate without the visual defects usually attributed to surface moisture (cf Bulletin Rubber Grower's Association 1925 p. 388) and (*b*) that his finished sole crepe shall not develop fungal spots or stains in transit, through the presence of raw rubber or too high an overall moisture content. Following certain definite procedures it seems possible to define (at least for some cases) rather approximately the moisture content at which the probability of visual defects at lamination is high, but there is the obvious difficulty that the value generally required is the surface moisture content of the lace, whereas that measured is the moisture content of the whole

lace sample. Definition of the moisture content of factory laces, such that the probability of the incidence of fungal staining during storage of the crepe for X months is extremely low, is probably difficult as the samples seem to vary in the ease with which staining starts under various conditions. However it is hoped that useful data, additional to that already available in the literature may be obtained in this connection.

The requirement that the finished crepes shall be sold with the minimum moisture content would appear to imply minimum average moisture content of the laces together with a low standard deviation, for example, between laces. Since the moisture content corresponding to apparent equilibrium at tropical room temperatures has not been found to be independant of the relative humidity it is to be expected that the moisture content of ' dry laces ' from an unassisted loft may be higher than from a warm air tower, particularly in wet weather. Measurements to obtain data relating to typical modern Ceylon drying chambers are in progress. A collection of data of this nature should assist in deciding rapidly whether a drying tower is being adequately operated as well as its capabilities.

Two points in connection with the above seem to merit mention. Firstly, one present standard Estate method of estimating whether laces are dry, *e.g.*, the absence of raw rubber, does not seem to be an invariable guide to the actual average moisture content of the laces in an unassisted drying loft. Thus, while a skilled rubber maker will indicate roughly which laces are dry in say, 2 days, on the day of test and 2 days previously and the determination of the average moisture content of samples will arrange the laces in the same order of 'dryness', repetition on a second day with other laces does not necessarily give the same average moisture content for the various ' dryness classes.' Although a result of this nature for an unheated loft is to be expected on theoretical grounds it appears that this may have escaped the notice of some Estates' staff. It is hoped to repeat these measurements later with due precautions to ensure that the time of day is optimal (*i.e.*, corresponds to the lowest moisture content) at sampling cf Bulletin Rubber Growers' Association 1925 pp. 489. Secondly, it is known to many Estates' staff that in general sole crepe laces dried in an unassisted loft should not be milled too thick if the risk of ' spot disease ' is to be minimised. Limited tests with laces of various thickness exposed to various relative humidities at tropical room temperature suggest that one of the reasons for the above observation is that when the thickness and relative humidity are in certain ranges the higher thickness laces appear to have greater moisture contents at apparent equilibrium. In view of this observation it is possible that the conditions governing the drying of laces may not be entirely similar to the drying of the relatively thicker smoked sheets. Work on this aspect has commenced but will not be discussed here.

At the 1952 Bogor Conference Th. Schoon and P. J. van den Linden of I.N.I.R.O. suggested that by the controlled dialysis of coagulum a decrease in the drying time of about a quarter might be expected. A limited number of small scale experiments in the laboratory suggest that a decrease in drying time is possible, but the time of dialysis has to be controlled within certain limits. So far it has not been possible to try this process on a commercial scale.

Section No. 5. Compounded Rubber – Technical Classification :

1. Equipment.—Almost all the equipment ordered direct or through the agency of the London Advisory Committee has reached Ceylon. The major lack at present is the Mooney Viscometer which has to be specially modified in the London Advisory Committee's workshops to operate on D.C. power. There is, however, every hope that this should arrive early in 1953. The second

mill and the various spare motors and bushes etc., have not yet arrived. The remaining units *e.g.*, mill, 2 daylight press and strain tester are erected and are in apparent good working order. Conversion of the press from series to parallel heating was carried out by Messrs. Brown's Ltd. using parts ordered by the London Advisory Committee. Portions of the space in the factory set aside for the Chemical Department has not yet been vacated by Estate Department, and the refrigeration unit for the constant temperature room where the strain tester etc., will be kept has not yet arrived.

2. General.—The expectation given previously (1951 Report p. 12) that the training of the personnel in the use of the equipment might commence by mid 1952 was not realised. The decision to delay the commencement of training principally until shortly before the Mooney Viscometer (required for routine control or determination of compound viscosity, Vc) could be expected to arrive was taken with the approval of the Director. Now that the Mooney Viscometer is expected shortly, training has commenced.

The Co-ordinating Officer for technically classified natural rubber of the International Rubber Research Board visited Ceylon during the course of his South East Asia tour. The Co-ordinating Officer, Dr. R. G. Newton, addressed a meeting (convened by the Institute) of representatives of the Ceylon rubber industry including the Packing Companies. A summary of Dr. Newton's talk with comments and explanations as appropriate has been issued to Agency Houses, the Planters Association, the Low Country Products Association and to the Rubber Traders' Association, Colombo for distribution amongst Packers.

The general background of this subject (with reference to Ceylon) may be found in various publications (Special Quarterly Circular in 1950 ; 1951 Report pp. 12, 13), restricted circulation papers (Circulation Papers No. 1510, 1560) and restricted circulation leaflets of the Institute. During the year there has been some criticism in the literature of the idea and scheme of classification, but the general impression especially with regard to modulus classification is very favourable. The tendency to play down the Mooney classification noted in the 1951 Report p. 13 has finally resulted in a decision on an international scale equivalent to discarding this classification with effect from December 31st 1952.

It is anticipated that rather more than 20,000 tons of R.S.S. will have been classified and marked during 1952, mostly in Malaya and French Indo-China. So far the classification has been largely confined to R.S.S. 1, but consumers have expressed an interest in the classification of the lower grades.

Considerable numbers of references to improvements or suggested modifications to the modulus classification procedure are to be found in the technical literature for the year. Means of decreasing the time interval between sampling and completion of testing are being persued, apparently with success in Malaya. It has been suggested by the London Advisory Committee that since the correlation between strain and hardness and between modulus and hardness is high (1951 Report p. 16 ; *et al*), hardness testing in preference to strain or F 100 testing could appreciably simplify certain stages of the testing procedure. The testing carried out in the experiments described below was performed by the London Advisory Committee.

3. TC. B.2 (6 Estates × 6 Days).—In this experiment 6 Estates, selected according to geographical location and size (1951 Report p. 14) were sampled on two groups of 3 days. The time interval between the 2 groups of days normally exceeded a month, but the interval between days within a group was much smaller. Sampling took place by random selection of one smoked

sheet from each eighth portion of the day's production of smoked sheets. One quarter of each smoked sheet was randomly subsampled and the first four such subsamples were made into one bundle distinct from the subsamples making the second bundle. Thus, on each day for each Estate portions of 4 sheets from each half of the days production were selected and the two bundles despatched to London for testing as 2 mixes × 2 cures. In testing the samples taken on the second 3 days, the 36 bundles were divided by the London Advisory Committee into two lots of 18, and each lot sampled by one of two methods, viz : the bundles of 4 sheets were (*a*) chopped vertically in half or (*b*) separated horizontally into 2 samples of 2 sheets. To eliminate the influence of day to day variations in level of testing equal numbers of samples obtained by the two methods were included on each test day. It was thought that method (*b*) might give a greater variance than (*a*), as method (*b*) should be a measure of between sheet variation and the method (*a*) of the variation within sheets ; however, no clear evidence of such a difference was established by the London Advisory Committee.

For strain data corrected to a Vc of 40, the analysis of variance of the 287 degrees of freedom from the 288 cures shows that the variance between Estates is, and that between Days is not significant in comparison with the ' Estates × Days ' interaction. Of the first order interactions only the variances due to ' Estates × Days ' and ' Days × Bundles ' appear large in comparison with the variance due to the second and third order interactions considered together as remainders. The detailed analysis of variance is at present interpreted to mean that for strain (*i.e.*, modulus classification) the differences between these Estates are likely to be significant, but the differences between Days are not so important possibly because different Estates behave differently on different days. This does not imply that for any one Estate the differences between strain values for the different days is unimportant as can be seen from the table of analysis of variances for the 47 degrees of freedom of the individual Estates, an abstract of which is given below for corrected strain data.

Source of Variance	*Highest* (*Estate S*)	*Lowest* (*Estate V*)
Between Mean figures for Days	48.45	3.30
S.D. of Means for Days	6.96	1.82

The daily production of sheets of the selected Estates differed and 8 sheets represent a sampling intensity of about 0.7% to about 10% according to the Estate. Making certain assumptions about the suitability of the sampling intensity and general procedure one can arrive at the conclusion that the standard deviation of the mean corrected strain value for days is of the order of between about 7.0 and 1.8, implying that the day to day mean variation of Estate V may be quite low but that of Estate S quite high. For the 4 remaining Estates the standard deviation by this procedure, would be about 4.5 corrected strain units, which happens to be numerically slightly higher than the between bale means (actually between estimates of bale means or bale samples) found for some Estate classified R.S.S. in Malaya.

It has been suggested that some information on the variability of the sheets or bulks of sheets within Estates and Days may be obtained from a consideration of the variance between bundles *i.e.*, between lots of 4 sheets per Estate per Day.

Source of Variance	*Highest* (*Estate A*)	*Lowest* (*Estate V*)
Between Means for Bundles	28.13	4.69
S.D. of Means	5.30	2.17

The point that numerical figures deduced in this manner are not necessarily accurate is fully appreciated, but it should be understood that the object of the experiment was to obtain some 'pointers' without overtaxing the testing capacity of the London Advisory Committee. One alternative was a repetition of T.C. — B. 1 (29 Estates × 1 Day) which was considered to be less valuable, another was to test each sheet sampled in T.C. — B. 2 which would probably have overloaded the testing facilities unduly. The conclusion drawn from this experiment is that the Estates are producing R.S.S. which falls within the modulus limits envisaged in the scheme of classification and that certain Estates, *e.g.*, Estate V above, appear to be capable of producing comparatively uniform R.S.S. which could probably be readily classified. In the latter connection it is worth recording that in the original T.C. — B. 1 experiment, where the sampling took place on 1 day about the beginning of 1951, the production of Estate V was classified as blue and in all six days of T.C. — B. 2 the strain values obtained again place it in the blue class.

4. Experiment T.C. — C.1 Packing House Preliminary Experiments:

Almost all, if not all Ceylon R.S.S. is sold loose (*i.e.*, unbaled) by the producers and the baling carried out by specialist Packers in Colombo or Galle. Most of the island's R.S.S. appears at present to be produced on medium sized (by Ceylon standard) and small Estates or by Small Holders. It is therefore by no means certain that Estate classification of R.S.S. will in general be a practicable proposition in Ceylon, especially as classification in the Packing House seems the only suitable procedure for Small Holders R.S.S. The small size of the producing and smoking units and the relatively large size of the packing houses could mean that whilst the standard deviation of the R.S.S. population in a packing house might be quite large, a fair measure of blending might actually occur during process at the packing houses. With the co-operation of Messrs. Hayley & Kenny Ltd. Colombo a small scale experiment was initiated to obtain some information on this point (1951 Report p. 15).

For the purpose of this report the experiment was on the basis of 1 Packer × 3 Consignments (Days) × 3 grades of R.S.S. (No. 1,2,3) × 3 bales × 2 mixes × 2 cures. The bales were randomly selected and sampled by cutting off a corner of at least 50% of the sheets making up the bale. An analysis of variance is shown in the table below, for strain figures corrected to Vc = 40.

Source of Variance	*Deg. of Freedom*	*Variance*
Between Consignments (C)	2	150.65
Grades (G)	2	297.84
C × G	4	9.67
Bales, within grades	18	32.49
Samples, within Bales	27	5.87
Cure Testing Errors	54	1.11

The principal conclusion of the testing personnel at the London Advisory Committee was as follows : ' Bearing in mind the much smaller scale of the experiment than any carried out in Malaya, one is left with the impression that the bale variability is less than that given by Newton *et al* for Malayan bales selected at random from packing houses where blended packing is not carried out (I.E.C. 1951 *43* p. 332). Blending of the sheets in Malaya however, was shown to result in a greatly reduced variance between bales for strain and would also be of benefit in Ceylon.' The table showing the mean strain value and an estimate of the standard deviation of bale means (bale sample) for each grade amplifies part of the conclusions.

	R.S.S. 1	*R.S.S.* 2	*R.S.S.* 3
Mean corrected Strain	71.6	67.8	66.0
Estimate of the average S.D. of Bale Means	1.52	1.95	3.90

The detailed analysis of variance for principle effects and first order interactions has been worked out and gives rise to an overall average estimate of the standard deviation of bale samples of 2.41 corrected strain units. Bearing in mind the small number of bales involved, the long interval of time between manufacture and sampling in Ceylon and testing in London as well as the inability of the Institute to supervise the whole of the random sampling, the experiment shows no justification for the conclusion that these Ceylon R.S.S. 1 and 2 samples lack a very reasonable measure of uniformity. No doubt this could be due to the fact that the bales making up the consignments probably included a large proportion of relatively uniform Estate R.S.S., whereas the raw material for the R.S.S. 3 bales may have included R.S.S. from a large number of smaller units probably with independent smokehouses.

The limits of the (central modulus) yellow class for strain are 67–91 *i.e.*, 79 ‡ 12 and the strain figures in this experiment are quite close to the yellow blue border. Therefore particularly in the case of the R.S.S. 2 and 3, marking the consignments (of which the bales tested formed a sample), either yellow or blue would be expected to give an appreciable proportion of the bales misclassified. It is understood that this problem and that of defining the maximum permissible standard deviation of bale means or bale samples is being studied on an international level and it is therefore now desirable for the Institute to persue this subject further. Accordingly various Packers have been circulated with requests for co-operation in further experiments designed to supplement the preliminary information available from and supplied to them in regard to T.C. — C. 1.

5. Future Programme.—It should be recorded here that the future of technical classification of R.S.S. in Ceylon must very largely depend upon the attitude ruling in minds of the major consumers, at present China. The Co-ordinator for technically classified natural rubber in his address in the Chamber of Commerce on November 11th suggested that Ceylon blanket crepe might be quite suitable for classification, possibly on the Estate or in the packing houses. Before going ahead in detail on this subject Packers have been asked to supply details of the names of the buyers of blanket crepe in order that the Institute's agents may then be in a position to ascertain what proportion of this material is employed in uses requiring vulcanisation.

(b) Miscellaneous :

1. Peradeniya Hard Rubber Trees.—The history of these trees is recorded elswhere (1951 Report pp. 15–16). In 1951, the rubber from one tree when compounded in the M.P.C. tread mix showed a high resilience in combination with a low modulus. Tests in 1952 on samples from a second period of tapping have been made and the combination of high resilience and low modulus in the M.P.C. tread mix was not repeated. In view of the low yield of rubber in grams per inch of cut from these trees it is doubtful whether any of them are at present worth further study and the correspondence has therefore been turned over to the Botanist.

2. Cyclised Rubber.—Some interest has been shown by a local Agency House in the sample of cyclised rubber soling compound obtained by the Director whilst on his visit to the United Kingdom in November. It appears doubtful whether the full details and rights in the new process worked out by the British Rubber Producers' Research Association and Rubber Technical Developments Ltd. will be available to the Institute at present, for reasons beyond the scope of this report.

Research Laboratories,
Dartonfield,
Agalawatta.
20th February, 1953.

REPORT OF THE BOTANIST FOR THE YEAR 1952

By

C. A. de Silva

Staff.—The writer was granted six months overseas leave and proceeded to Europe in May, 1952. He assumed duties on November 1st, 1952. Ir. J. H. Van Emden acted as Botanist during the leave period.

Mr. P. W. de Silva (appointed on probation as a Research Assistant to the Botanist on 1st January, 1951) was transferred on 15th September, 1952 to the Small Holdings Propaganda Department as a Probationary Assistant–Propaganda Officer with the approval of the Board of Management. Throughout the year 1952, Mr. de Silva was entrusted with the supervision of field experiments of the Botanical Department at Nivitigalakele.

Mr. L. Wijeyegoonewardene was selected for the post of Assistant to the Botanist. He will carry out a large scale pollination programme during the flowering season in 1953, under the supervision of the Botanist. He is expected to take up duties in January, 1953. This appointment was made on a recommendation of the Director, which was approved by the Board of Management.

Mr. W. G. V. Fernando carried on his duties as Computer under the supervision of the Botanist during the year under review. He also performs the duties of a laboratory assistant to the Botanical Department. In addition to four " Odhner " calculating machines used by the field staff, a " Facit " electrical calculating machine has been provided during the year. This machine greatly facilitates the work of the final analysis of experimental data submitted by the Field Assistants from the three experimental stations.

General.—Experiments on growth and yield of clones and clonal seedlings were continued in 1952. This work also entails general observations on other secondary characters, which include the recording of the incidence of diseases, and growth characteristics. Investigations of special interest are those connected with bud variation, the selection of high yielding clonal seedlings by the Morris-Mann method of early tapping, crown-budding effects on budded centre sections, " avenue " planting, and use of " rainguards " on tapping panels.

Growth is assessed by girth measurements, taken once a year of all trees in each experiment. Test-tapping, carried out on normal tapping days by trained field staff once or twice a month, remains the criterion for yield. In the early years of tapping, yield results are expressed in grams of dry rubber per tree per tapping. In the older experiments yields are empirically calculated on 140 tappings in pounds of dry rubber, per tree, per year. These figures afford accurate comparisons between material under test and the controls of standard high yielding clones, under the conditions of each experiment. When these yield figures are translated in terms of yields per acre per year in commercial practice, a number of limiting factors must be taken into account, such as the stand of trees per acre, the number of tappings, the particular tapping system, general cultural practices including disease control, manuring and environment.

From 1952, semi-commercial areas of the most promising material will be planted out, entailing 5 to 10 acres of each clone or clonal seedlings, which will give the necessary information for general advisory work. At the same time planting material will be issued to estates in the various rubber planting districts of Ceylon for supplementary information.

In the general development scheme of the Hedigalla station, which has approximately 1,000 acres to be planted with material selected for trial, a double chamber drying house was completed in 1952 for drying experimental test-tapping biscuits from about 240 acres planted up to the end of 1952. The necessary accommodation has also been provided for a hand roller, filing of biscuits, and weighing machines. The new equipment will enable the Field Assistant at Hedigalla to attend to the preliminary summaries of experimental data by recording the dry weights of rubber from individual trees and plots of large scale clone trials. This work was previously done at Dartonfield which entailed the transport of biscuits from Hedigalla to Dartonfield.

The experiments in the three sub-stations of the Institute, Dartonfield, Nivitigalakele, and Hedigalla are reviewed for the year 1952 in this report.

Rainguard Experiment, 1934, Replanted Area, 7½ Acres Dartonfield

This experiment which provides for comparison between trees with and without rainguards on three clones GL 1, AV 256, and PB 25 was continued in 1952. Experimental tapping commenced in July 1951, and for the half year ending December 1951, the increased yield in favour of guarded trees was only just over 8 per cent of the control. The results for 1952 are given below :—

Rainguard Experiment. 1934 Replanted Area, Dartonfield
Yield in lbs. for dry rubber

	Rainguards	*Controls*
Preliminary yields March to June 1951	896.6	804.9
Experimental yields, January to December, 1952	2791.9	2649.9
Approximate adjusted yields for preliminary differences	2746.1	2695.8
Excess yield	50.3	
As per cent of control	1.9	

Analysis of Tapping Days, Jan. to Dec. 1952

	No. of Days
Normal tapping	226
Late tapping	61
No tapping due to rain	26
Estate holidays	8

All trees were rested from 10th February to 24th March.

Even without a correction for the preliminary yielding capacity of the experimental trees the excess yield is just under 5½ per cent of the control. The lack of better response to the use of rainguards is partially due to the particularly dry year in 1952. Even so, the results far from confirm the greatly increased yields claimed for the use of rainguards on some estates.

On most estates yields from " guarded " trees have been compared with controls, under conditions totally different from the " guarded " trees. Differences in acreages utilised, clonal differences, differences in tapping age of trees, periods of tapping, capabilities of tappers, have not been taken into account in assessing increased yields. Under these conditions comparisons with such controls are totally inadmissible statistically, and the greatly increased yields presented can be very misleading.

The experiment at Dartonfield is not of the best, as we have no more suitable areas free of experiments to utilise for use of rainguards. On comments from visiting planters, improved methods of fixing rainguards will be tried out in 1953, and the guards will be changed over to control trees from the present guarded trees. The maintenance of the rainguards in good workable condition throughout each tapping year is a difficult problem on most estates.

The economic advantage of the use of rainguards in this preliminary trial at Dartonfield remains problematical, and it will be interesting to note further results from outside estates, where it is possible to compare increased yields from the use of rainguards with control areas, tapped as far as possible under equal conditions in the absence of replications.

1939 Replanted Area, 2 acres, Dartonfield

The test tapping of four selected Prang Besar " fraction " clones was continued in 1952. The clones have been tapped for 8 years, and the results for the last four years are given in Table I.

TABLE I

Clone	Tapping Commenced	No. of trees tapped 1952	Brown Bast trees	Yield in lbs. per tree per year, 140 tappings			
				1949	1950	1951	1952
PB6/9	Mar. '44	38–45	7	13.1	9.3	8.6	10.6
PB5/60	Sep. '44	24–28	6	11.6	10.4	9.3	8.8
PB5/139	Mar. '45	30–31	1	8.7	7.2	6.9	6.8
PB6/50	Sep. '48	10	–	9.1	6.8	7.9	6.4

It is interesting to note that clone PB6/9 has given very satisfactory yields in 1952, although the clone comes in for sustained attacks of Oidium each year. The clone has been used in pollination work with the hope that this undesirable characteristic will be eliminated in a proportion of the crosses.

Replanting Experiment, 1941, 6½ acres, Dartonfield

Five clones of the R.R.I. ' 500 ' series are planted in this area. The trees were first tapped in March, 1948. The yield results for 1952 are summarised under together with those for the previous year.

R.R.I. ' 500 ' Series Clones

Yield in lbs. per tree per year, tapped S/2, d/2, 100%

Clones	R.R.I. 500	R.R.I. 501	R.R.I. 506	R.R.I. 520	R.R.I. 514	Clonal Seedlings
No. of trees tapped	80–86	69–78	42–74	70–89	83–91	90–95
Yield 1951	10.2	17.2	10.3	9.7	6.5	8.9
(140 tappings) 1952	7.2	14.9	8.0	8.7	6.1	9.1
Brown Bast cases	16	25	50	19	3	10

It is just possible that Brown Bast cases may be accelerated during the early years of tapping, as trees of 18 inches girth are tapped for experimental purposes for early information. It has now been decided to introduce a tapping intensity of 67% on all trees tapped at 18 inches for the first 3 tapping years.

The clones in 1952 show yields of a lower order compared with the previous year. The illegitimate clonal seedlings in this area have, however, maintained their standard of yields presumably due to the variability in susceptibility of mixed clonal seedlings to Oidium leaf disease, which was particularly severe in the year under review.

Clonal Seedling Trial, 1947 Replanted Area, Dartonfield

The following clonal seedling material is planted in this area :—

(1) TJ. 1, selfed seed
(2) PB 86 illegitimate seed
(3) PB 5/139 illegitimate seed
(4) Collection of H.P. seedlings representing a hypothetical seed garden with clone parents TJ. 1, BR 2, AV 163, AV 255
(5) TJ 1 (budded), control

The experiment consists of 8 replications of each type of clonal seedling and the control with plots of 30 trees.

The trees in this area were selectively thinned out on the Morris-Mann system of early tapping from 260 to 160 trees per acre in July 1951. Tapping on a commercial basis started in 1952 and test-tapping is carried out twice each month on a per tree basis. Table II compares the yields on the Morris Mann system with the yields in 1952.

TABLE II

Clonal seedling trial, 1947 Replanted Area

Planting Material	TJ 1 Seedlings	PB 86 Illeg. Seedlings	PB 5/139 Illeg. Seedlings	H. P. Seedlings	Control TJ 1 (budded)
Yield in gms. per tree for 5 tappings (Morris–Mann)	24.1	18.2	30.4	29.8	Not tapped
Yield in gms. per tree per tapping 1952	10.0	8.5	14.8	15.1	*19.5

*TJ 1 budded tapped from Sept. to Dec. only. Trees thinned out on growth figures from 260 to 160 per acre.

A correlation will be worked out between yields obtained by the Morris–Mann system prior to selective thinning, and the yields of the mature selected trees in the first year of tapping on a per tree basis. These results will be published in a later report.

A frequency table presenting numbers of trees of the four types of clonal seedling material in each yielding class is given below. The distribution shows the extent to which the high yielding trees have been concentrated within each type by selective thinning on growth and yield characteristics. Tentatively it would appear that under the conditions of this experiment the seedlings of clone PB 5/139 and the selection of hand pollinated (H.P.) seedlings of clones TJ. 1,

AV 255, BR 2 and AV 163 show a greater concentration of trees in the higher yielding classes than TJ. 1 and PB 86 seedlings. The illegitimate seedlings of clone PB 5/139 were collected from an area adjacent to clones AV 163, BR 2, which are well known seed parents, hence its quality. The seedlings of clone PB 86 have in the preliminary year of test-tapping given the poorest results ; 28 trees of the clone are not in tapping yet owing to poor growth.

Clonal seedlings 1947 Replanted Area

Frequency numbers in the second tapping year

Yield Class per tapping per tree	TJ. 1	PB. 86	PB5/139	H. P. Seedlings
0–5 gms.	23	34	3	2
> 5–10 „	124	115	65	35
>10–15 „	56	45	75	70
>15–20 „	20	15	46	67
>–20 „	16	3	50	47
TOTALS	239	212	239	221

1939 Clearing, Field 6A, 10½ Acres, Nivitigalakele

Test tapping has been continued on a selection of 8 clones from thirty seven new local clones originally included for trial. The yields for the last 4 years of tapping are compared with those of control clones in Table III. The area was first tapped in 1945.

TABLE III

1939 Clearing Field 6 A, Tapping System S/2, d/2, 100%

Clone	No. of trees tapped 1952	Yield in lbs. of dry rubber per tree per year, 140 tappings				Total cases of Brown Bast 1952
		1949	1950	1951	1952	
NAB 3	20	12.1	11.4	11.0	12.8	3
NAB 8	18–20	11.0	11.0	11.2	12.2	7
NAB 11	19–20	10.8	10.9	10.8	11.1	3
NAB 12	18	13.3	15.1	15.4	17.4	5
NAB 15	18	15.9	15.0	14.7	13.6	2
NAB 16	19	10.8	9.1	8.4	8.1	1
NAB 17	20	15.2	14.9	14.2	15.6	9
NAB 20	18–17	15.5	16.7	14.6	18.4	5
Control						
PB 86	20	13.2	13.0	15.3	17.3	1
WG 6278	19–20	7.9	8.0	8.1	8.5	2
MK 3/2	18.19	9.9	10.4	11.2	12.5	4

Clone NAB 20 is the best yielder but has a definite crooked growth, which persists in the mature tree. Although this is not a deterrent to good tapping it may not be favoured on this account ; two trees have been wind damaged in recent years. NAB 17 shows a high incidence of Brown Bast, but may give high yields on a lower intensity of tapping without this bark affection. Clones NAB 12, 15 and 20 have been planted on a large scale commercial trial at Dartonfield in 1952, with clones PB 86 and RRI 501 as controls. Each clone is replicated fivefold with a plot size of 200 trees.

1940 Clone Trial, Field 6B, 9½ Acres, Nivitigalakele

A selection of clones is test-tapped in this area originally planted with a collection of foreign clones reputed for high yields in their countries of origin. The trees were first tapped in January 1947. The yields for the last four tapping years are summarised in Table IV.

TABLE IV

1940 Clone Trial, Field 6B

Tapping System S/2, d/2, 100%

Clone	No. of trees tapped 1952	Yield in lbs. per tree per year of 140 tappings				Brown Bast cases	Wind damage cases
		1949	1950	1951	1952		
AV 255	20	9.9	13.3	12.3	15.1	8	6
RRI 501	20–23	11.7	10.8	13.0	13.9	4	2
RLD 1	23	8.0	9.8	10.5	12.3	–	1
PR 107	23	10.1	10.1	10.5	11.6	1	1
WAR 4	23–24	7.3	9.7	8.7	11.0	2	—
RRI 513	24	11.2	10.5	9.2	11.1	2	2
AV 352	19	7.7	9.2	9.5	11.3	4	4
LUN. N	20–21	8.2	9.7	8.9	10.5	3	2
PR 105	23	8.4	9.2	8.9	10.0	3	—
PB 6/50	22–23	8.9	11.1	9.5	9.3	5	1
RRI 519	21	7.1	8.0	7.9	8.8	6	2
RRI 504	24	8.0	6.9	7.4	7.7	–	—
RRI 511	21–22	7.3	6.9	6.5	7.7	3	1
RRI 500	19–20	7.1	10.0	6.4	6.8	8	1
Controls							
TJ. 1	23	8.1	10.8	10.8	7.7	5	1
WG 6278	22	6.5	9.4	8.1	9.7	–	2

The clones are growing on a steep gradient and much of the wind damage may be due to this factor. In general, clones AV 255, RRI 501, PR 107, RRI 513 can be planted on a large scale on estates, where these clones have already given satisfactory results. Clone RLD 1 will be planted for final test in a commercial scale in 1953–54. Budwood of this clone is being multiplied for this purpose.

The depression in yield of the control clone TJ. 1 may be partially due to the particular dry conditions in 1952. This clone is known to react adversely to dry conditions, especially during the wintering period.

1941 Clearing, Field 6C, 7 Acres, Nivitigalakele

Seedlings from hand pollinations made in 1939 are planted in this area. Five tree clones of a proportion of the seedlings, selected on pricking tests for indications of high yielding characteristics, were planted in the same clearing in an adjacent area. Test-tapping was continued on the clonal seedling families, and the promising clones of the R. R. Series. The yield results are summarised in Tables VA and VB from 1949 to 1952. The seedlings and buddings were first tapped in 1947.

TABLE VA

1941 Clearing, Field 6 C
Tapping System S/2, d/2, 100%

Family	No. of trees tapped in 1952	Yield in lbs. per tree per year on 140 tappings				Brown Bast cases
		1949	1950	1951	1952	
BS3 × MK3/2	46–48	8.2	9.4	11.5	12.2	7
BS3 × PIL. A. 44	36–37	6.5	7.7	8.3	9.0	5
PIL A44 × WG6278	18	5.6	7.4	8.7	8.1	1
BS3 × WG6278	40	15.0	13.6	15.6	16.6	2
PIL. A. 44 × BS. 3	15–16	5.2	6.2	6.3	6.8	1
Control						
WG 6278 (budded)	41	—	—	—	9.0	1

The three local clones MK 3/2 BS. 3 and WG 6278 give indications of promise as seedling parents. These local clones have been included in a number of seed gardens planted out on estates.

TABLE VB

1941 Clearing Field 6C
Tapped on S/2, d/2, 100%

Clone	Mother Tree No. and seedling family	Test pricking Class of mother †seedling	Yield in lbs. per tree per year of 140 tappings				Brown Bast cases
			1949	1950	1951	1952	
*RR 116	28,BS3 × MK3/2	1	12.5	13.7	13.8	15.7	–
**RR 128	43,BS3 × MK3/2	3	8.9	10.2	13.4	15.5	–
**RR 129	44,BS3 × MK3/2	3	9.0	10.8	12.4	14.9	–
*RR 134	50,MK3/2 WG6278	3	11.2	15.8	11.6	14.8	–
RR 124	39,BS3 × MK3/2	2	11.4	10.4	13.9	14.6	1
*RR 163	110,PIL.A.44 × WG6278	2	9.2	12.1	10.4	14.6	–
RR 197	185,BS3 × TJ.1	1	9.4	8.5	11.7	14.6	2
*RR 119	31,BS3 × MK3/2	2	9.6	11.4	11.5	14.3	–
*RR 108	16,BS3 × MK3/2	1	13.5	14.5	13.3	14.2	2
**RR 123	38,BS3 × MK3/2	2	8.5	9.7	10.6	13.2	–
**RR 125	40,BS3 × MK3/2	2	11.5	11.3	11.5	13.8	1
**RR 126	41,BS3 × MK3/2	1	11.6	9.7	11.6	13.5	2
*RR 181	147,BS3 × WG6278	1	10.8	11.8	13.7	13.2	–
RR 169	120,BS3 × WG6278	2	8.5	8.9	11.6	12.5	–
**RR 111	21,BS3 × MK3/2	2	9.6	10.1	11.7	12.5	2
RR 131	47,BS3 × MK3/2	1	8.6	9.5	11.6	12.4	1
RR 195	183,WG6278 × MK3/2	4	14.0	9.7	8.2	12.2	1
**RR 168	118,BS3 × WG6278	2	8.8	9.1	12.4	12.0	2
**RR 173	129,BS3 × WG6278	1	9.6	11.1	10.6	12.0	–
**RR 120	34,BS3 × MK3/2	–	9.5	9.5	12.1	11.9	–
RR 198	186,BS3 × TJ.1	2	9.1	9.1	11.0	11.4	1
**RR 121	36,BS3 × MK3/2	2	10.8	10.3	11.3	10.8	–
**RR 146	77,BS3 × PIL.A.44	2	9.3	10.0	10.3	10.8	–
**RR 153	91,PIL.A.44 × WG6278	1	10.8	10.7	13.3	10.9	1
RR 196	164,WG6278 × MK3/2	3	10.3	8.9	8.4	9.4	–

*Included in 1950 clone trial

**Budwood multiplied for large scale trials

†No. 1 indicates the best yielding class and corresponds to Dr. Cramer's No. 5 Testatex Class.

The clones in Table VB have been selected from a total of 110 tested in the 1941 clearing. Six as indicated above have been planted out in a clone trial and budwood of most of the remaining clones is being multiplied for large scale trials in 1953–1954. The high quality of both seedling and budded material in this 1941 clearing is confirmed by the general estate yield figures for the whole area showing 1013 lbs. dry rubber per acre for 1952. The test-pricking class of the seedling mother trees obtained by Dr. Cramer's Testatex knife is given in the above table in column 3. No. 1 indicates the highest yielding seedling class at the age of approximately 18 months in the nursery. Clones were originally established mostly from seedlings in classes 1 to 3 as being indicative of potentially high yielders. It is interesting to note that 3 of the highest yielding clones established come from class 3. One clone from a class 4 seedling has also come within the selected list.

1942 Clearing, Field No. 7 (.5 acres,) Nivitigalakele

1940 hand pollinated seedlings were planted in this area with a small number of illegitimate seedlings of clone AV 185. Clone WG 6278 was used as a budded control. The material was originally distributed in the experimental layout and guard rows. Table VI summarises the yields of the families with a sufficient number of seedlings for observations on the potentialities of clonal parents. The trees were first tapped in 1949.

TABLE VI

1942 Clearing, Field No. 7
Tapping System S/2, d/2. 100%

Clonal Family	No. of trees tapped 1952	Yield in lbs. per tree per year for 140 tappings			
		1949	1950	1951	1952
BS3 × HC28	70–68	3.0	4.8	6.9	7.1
BS3 × TJ.1	69–71	4.0	6.8	9.4	10.0
AV185 Illeg.	20–21	3.0	4.6	7.5	8.4
WG6278 (budded)	63	4.5	5.9	8.4	12.9
Boundary trees					
BS3 × HC28	63	—	—	6.3	6.6
BS3 × TJ.1	28–29	—	—	8.4	9.7
WG6278 (budded)	56–65	—	—	7.9	11.7

The BS.3 × TJ.1 crosses show a very promising standard of yields in the fourth year of tapping, without any selective thinning. Clone BS.3 which is not a very high yielder has crossed well with most parents, and must be considered a very desirable clone for inclusion in seed gardens. It is also a particularly good seed bearer.

Budded control clone WG 6278 shows a better standard of yields than in most experimental areas and the indications are that the clone comes up to standard in good soils.

1944 Small Scale Clone Trial, Field 8, 4½ Acres, Nivitigalakele

Ninety clones established from the hand pollinated seedlings in the 1944 clearing at Nivitigalakele are planted in this area as 3 tree plots. Clone WG 6278 was allocated as a control to every 6 plots in a balanced incomplete block layout. Yields of clones selected for further test-tapping are summarised in Table VII for 1951 and 1952. The trees were first tapped in 1951.

TABLE VII

1944 Small Scale Clone Trial, Field 8, 4½ Acres
Tapped S/2, d/2, 100%. Yields in lbs. per tree
per Year of 140 tappings

Clone	Seedling Family	Yield	
		1951	1952
2/101	BS3 × TJ.1	6.4	9.9
WG6278		5.9	6.0
2/105	BS3 × TJ.1	6.9	11.0
WG6278		4.3	5.1
5/5	HC28 × WG6278	6.1	9.8
WG6278		5.0	7.0
1/132	BS3 × HC28	5.6	6.4
WG6278		5.0	5.7
1/115	BS3 × HC28	*9.7	14.9
1/44	BS3 × HC28	6.7	8.6
WG6278		4.3	5.1
7/1	Ill. Sdlg. AV 185	6.5	8.0
1/3	BS3 × HC28	6.4	11.9
WG6278		4.3	3.3
1/101	BS3 × HC28	7.1	10.9
1/37	BS3 × HC28	6.6	9.6
2/81	BS3 × TJ.1	*8.0	10.5
WG6278		4.6	6.6
2/41	BS3 × TJ.1	*8.8	10.5
2/28	BS3 × TJ.1	—	7.7
2/14	BS3 × TJ.1	7.3	12.6
WG6278		4.6	4.6
2/18	BS3 × TJ.1	*8.0	10.0
2/33	BS3 × TJ.1	6.5	7.2
WG6278		5.1	6.1
2/35	BS3 × TJ.1	6.8	11.1
2/78	BS3 × TJ.1	6.0	6.1
7/18	Ill. Sdlg. AV 185	6.1	10.0
WG6278		3.9	4.4
1/48	BS3 × HC28	6.0	8.1
2/5	BS3 × TJ.1	6.1	8.0
1/111	BS3 × HC28	5.9	9.2
WG6278		5.2	5.8
1/17	BS3 × HC28	5.6	11.9
WG6278		5.7	6.9
1/121	BS3 × HC28	6.3	7.9
2/40	BS3 × TJ.1	5.7	9.1
WG6278		3.9	4.4
2/96	BS3 × TJ.1	7.4	14.7
2/103	BS3 × TJ.1	5.8	9.3
WG6278		5.1	6.1
1/127	BS3 × HC28	5.7	6.7
WG6278		4.3	5.5

*Budwood multiplied in 1951 for large scale trials.

Clones showing yields of 10 lbs. and over in the second year of tapping are very promising. 4 clones selected in 1951 for further trial have come up to the 10 lb. level. A further selection of clones for budwood multiplication will be made in 1953 based on the above yields for 1952.

Large Scale Clone Trial, 1946 Replanted Area, 21 Acres, Nivitigalakele.

This area was planted in October, 1946 with a selection of foreign clones which had not been tested on a large scale hitherto. Each clone has plots of 64 trees replicated 8 times in a straightforward randomised block layout. Girth measurements taken in February 1952 are summarised under, together with the increment figures for 1951–52. This area which was rather backward in 1948 and 1949, has shown very satisfactory growth in 1951 and 1952 after a special manuring programme was undertaken for backward trees. On the present girth figures this area will be ready for experimental tapping in March 1953.

Large scale clone trial, 1946 replanted area. Mean girth in inches

Clones	AV255	AV352	PB6/9	PB5/60	LCB 1320	CIHM3	TJ. 1	PR107
1952	17.23	15.74	18.17	15.37	16.17	15.37	14.96	13.31
1951	12.80	11.51	14.09	11.59	11.79	11.58	10.82	9.53
Increase 1951/52	4.43	4.23	4.08	3.78	4.38	3.79	4.14	3.78

" A " and " B " budgrafts of clone MK3/2

The " A " and " B " series represent budgrafts established from the highest and lowest yielding trees of the original MK3/2 budgrafts established at the sub-station in 1928.

The average girth of 60 budgrafts in each series planted in alternate holes as single tree plots is given for measurement taken in January, 1953.

	Mean girth in Inches		
	January 1952	January 1953	Increased 1952/53
" A " Series	14.82	19.38	4.56
" B " Series	14.40	18.90	4.50

1943 Clearing, Trial of legitimate Seedlings, $4\frac{5}{8}$ acres Hedigalla

The 1941 hand pollinated seedlings are planted in this area with clone WG6278 (budded) as a control. A proportion of the seed was used in a randomised block experiment, and surplus trees were planted in boundary rows. The trees were tapped in September, 1950. Test tapping commenced in May, 1951. The yield results for 1952 are presented in Table VIIIA.

TABLE VIII A

Legitimate Seedlings, 1943 Clearing

Yield in lbs. per tree per year, tapped S/2, d/2, 100%

Seedling Family	No. of trees tapped	Yield
(1) MK1/3 × TJ.1	26	7.3
(2) MK1/3 × HC.28	11	6.0
(7) BS3 × DBK.1	58	7.8
(8) BS3 × H24	23	6.7
(9) BS3 × TJ.16	14	10.2
(10) BS3 × RH10	10	7.3
(13) RH10 × MK3/2	28	5.8
(19) DBK1 × MK3/2	15	7.6
(21) DK5315 × RH10	11	5.5
(22) TKD113 × BS3	13	9.6
(26) TJ.1 × PB86 (27) PB86 × TJ.1	26	8.1
(28) M65 × PIL.B.84 (29) PIL.B.84 × M65	29	6.4
(30) PB86 × PR107	25	11.8
(31) PB86 × M162	14	8.5
(39) M3 (RR9) × BS3	13	6.2
Budded Control WG6278	21	6.9
(11) BS3 × PB86	4	11.8
(12) BS3 × DK5315	6	7.2
(14) RH10 × TJ.1	7	9.2
(17) RH10 × TJ.16	6	7.6
(20) DBK1 × WG6278	4	6.8
(23) HC55 × TJ.1	3	9.2
(24) HC55 × WG6278	2	8.0
(16) RH10 × WG6278 (25) WG6278 × RH10	8 4	6.8 7.2
(35) BS3 × G771	3	14.3
(36) BS3 × MIR3	5	11.1
(41) DK3513 × BS3	2	14.2
WG6278 (budded) Surplus trees	65	7.4

The yields of the various families in the second year of tapping confirm that clone BS3 is a reliable seed parent and a good seed bearer. Clone PB86 crossed with clones PR107, TJ.1, BS3 and M162 has given high yielding progeny. Clone G771 and DK5315 crossed with clone BS3, have given 5 trees averaging 14 lbs. per tree. This is outstanding. In Table VIII B cross PB86 × PR107 has given six high yielding clones. The highest yielding clone 7/16 has been established from a cross of two local clones BS3 × DBK1, which are moderate yielders.

1943/44 Clearing, Small scale clone trial, 14 acres Hedigalla

280 five tree clones established from the 1941 hand pollinated seedlings were planted in the area. Tapping commenced in September, 1950. Yields of the more promising clones are summarised in Table VIII B for 1952.

TABLE VIII B

Yield in lbs. per tree per year, tapped S/2, d/2, 100%

Clone	Mother tree seedling family	Yield	Clone	Mother tree seedling family	Yield
*8/1	BS3 × HC28	12.6	19/14	DBK1 × MK3/2	13.4
9/1	BS3 × TJ.16	11.6	22/9	TKD113 × BS3	12.7
12/1	BS3 × DK5315	12.2	*27/10	PB86 × TJ.1	11.1
27/1	PB86 × TJ.1	12.0	*30/10	PB86 × PR107	16.9
28/1	M65 × PIL.B.84	12.1	1/14	MK1/3 × TJ.1	12.6
14/2	RH10× TJ.1	11.5	22/11	TKD113 × BS3	11.0
11/3	BS3 × PB86	10.9	*7/16	BS3 × DBK1	18.6
30/2	PB86 × PR107	10.6	30/18	PB86 × PR107	11.0
*12/8	BS3 × DK5315	15.1	*30/23	PB86 × PR107	9.4
30/7	PB86 × PR107	15.6	30/24	PB86 × PR107	12.0
*9/11	BS3 × TJ.16	11.4	26/10	TJ.1 × PB86	12.2
7/11	BS3 × DBK1	11.0	7/42	BS3 × DBK1	10.6

*Budwood multiplied in nursery, 1952.

1944 Small scale clone trial, 1¼ Acres, Hedigalla

Five trees each of sixteen clones are tested in this area. Tapping commenced in August, 1951. The yield results for 1952 are summarised in Table IX. Tapping commenced in August 1951 and not August 1952 as reported in the 1951 report. PB6/5 will be included in the 1953 planting programme for trial on a larger scale. The early yields of this clone are very promising on the limited number of trees in this experiment.

TABLE IX

1944 Small scale clone Trial, Hedigalla
tapped on S/2, d/2, 100%

Clone	Yield in lbs. per tree per year 140 tappings	Clone	Yield in lbs. per tree per year 140 tappings
RR20	4.6	RR28	7.2
RR21	3.8	RR29	6.4
RR22	3.8	AD24	4.7
RR23	5.5	DAR.1	3.1
RR24	6.5	AV214	3.4
RR25	7.5	PB5/122	7.1
RR26	4.1	PB6/5	10.3
RR27	5.2	WG6278 (Control)	6.2

Stem Branch-Budding Experiment 1¼ Acres, Hedigalla

A study of variation in buds is made in this experiment. Budwood from 10 hand pollinated seedlings in the 1942 clearing at Nivitigalakele was used for buds. " H1 " and " H2 " represent buds taken from two sections of the main stem, and " B " represents buds taken from branches. Tapping commenced in May 1951. The results are summarised for 1952 in Tables XA and XB as clonal yields, and yields for budgrafts established from the three types of buds.

TABLE XA

Yield in lbs. per tree per year of 140 tappings, tapped on S/2, d/2, 100%

Clones	1/130	1/5A	2/72	1/3A	2/32	1/1A	2/23	2/63	1/4A	2/108
Yields	4.9	5.6	5.8	2.8	6.6	4.8	8.4	6.7	2.6	7.3

TABLE XB

Budwood Type	Yield in lbs. per tree per year
H1	5.3
H2	5.7
B	6.0

There are fifteen trees of each clone in this experiment. The early results of four clones are quite promising. The differences in yields between the budgrafts established from the 3 types of buds are not statistically significant.

1945 Crown Budding Experiment, 11¾ Acres, Hedigalla

This experiment provides for a study of the effect of crown budding on budded centre sections. Each plot consists of 6 rows of centre budded sections of 6 trees each. Each of these plots of 36 trees have a single crown of the clones making up the centre sections. 6 plots of 36 trees each complete a single replication of crowns, which make up a block. Each block is replicated threefold. A summary of the rates of growth of centre sections 24¼ years after crown budding in September, 1950 is summarised in Table XI which also indicates the layout of a single block as described above. A splitting of the six tree rows for crown budding, three trees at a height of 5 feet, and three trees at a height of 8 feet, provides 108 comparisons for effects on centre sections according to the two heights of budgrafting.

TABLE XI

1945 Crown Budding Experiment. Girth Increments in ins. for two years 1950/52

Centre Sections	Crown						Means
	TJ.1	AV256	PM17	PB86	GL.1	RUB.393	
TJ.1	4.24	4.12	2.53	3.81	2.15	3.53	3.40
AV256	3.72	4.23	1.95	2.86	2.98	2.83	3.09
PM17	5.42	5.96	2.96	5.10	4.12	4.64	4.70
PB86	4.20	4.26	1.40	3.75	2.78	2.51	3.15
GL.1	4.85	5.38	2.18	4.40	3.73	2.31	3.98
RUB.393	4.61	5.51	2.43	4.06	2.85	3.55	3.84
Means	4.51	4.91	2.24	4.00	3.10	3.40	3.69

Summary of Increment Figures for Budded Centre Sections under the various crowns in inches

Crowns	TJ.1	AV156	PM17	PB86	GL.1	RUB.393	Mean
1950–51	1.43	1.69	0.49	1.16	0.83	1.10	1.10
1951–52	3.08	3.22	1.75	2.84	2.27	2.29	2.59
1950–52	4.51	4.91	2.24	4.00	3.10	3.39	3.69

The girth increment figures in the second year of growth after crown-budding show an improvement over the first year. The better growth is shown for the clones with heavy crowns like TJ.1, AV.256 and PB86. As the trees have not wintered on a full scale, Oidium leaf disease is not at present a serious disturbing factor.

The growth of budded centre-sections for crown-budding at heights of 5 feet and 8 feet shows no marked difference as shown below. The indications in preliminary experiments carried out in other countries are that yield of centre-sections may be affected by crowns budded under approximately 8 feet height according to the yielding capacity of the crown.

	Mean girth in inches of budded centre-sections
Crown budded at 5 feet ..	13.7
Crown budded at 8 feet ..	13.9

Large scale clone trial, 1945 clearing, 10½ acres, Hedigalla

Six PBS clones established from Prang Besar seedlings are tested against clone TJ.1 in this area. The 6 clones were the final selections of 120 three tree clones tested in Nivitigalakele in the 1935 clearing. Girth measurements taken in January, 1952 are summarised under, together with the increment figures for 1951/52.

Large Scale Clone Trial, 1945 Clearing
Mean Girth in Inches

Clones	PBS66	PBS69	PBS70	PBS90	PBS111	PBS181	TJ.1 controls
1952	17.10	14.08	15.53	17.68	13.98	15.33	14.38
1951	14.11	11.47	12.84	14.40	11.19	12.63	11.43
Increase 1951/52	2.99	2.61	2.69	3.28	2.79	2.70	2.95

Although this clearing is in virgin jungle, the soil in this area is particularly poor. The growth in 1951/52 has been satisfactory. The trees were taken into tapping at the end of 1952. Test tapping will be carried out in 1953.

1946 Clearing, 9 Acres, Legitimate Seedling Trial of 1943 H.P. Seedlings and Derived Clones

The 1943 hand pollinated seedlings, and five tree clones derived from these seedlings are tested in this area. Girth measurements were taken in December, 1952. The figures are summarised under together with those taken in December 1951.

1943 Clonal Seedlings, 1946 Clearing
Mean Girth in Inches

Family	No. of trees	Girth Dec. 1951	Girth Dec. 1952	Increase 1951/52
PB86 × BS3	63	18.63	20.71	2.08
PB86 × WG6278	19	18.77	20.39	1.62
PB86 × TJ.1	14	19.25	21.72	2.47
PB86 × MK3/2	9	18.64	20.35	1.71
Budded Control TJ.1	15	15.27	18.20	2.93
Extra Clone TJ.1	75	13.62	16.50	2.88

Tapping commenced on seedling trees at the end of 1952, hence the poorer girth increase compared with previous years. A few trees of the budded control were tapped and show a more normal increase for this rather poor type of soil. Test tapping will be carried out from 1953. The material is of particular interest with PB86 as the mother parent.

Mean Girth in Inches, 5 tree clones derived from 1943 H.P. Seedlings Hedigalla

	December 1951	December 1952	Increase 1951/52
5 tree clones (105)	15.26	18.73	3.47
Control TJ.1	13.76	18.08	4.32

There are 105 clones of the R.R. series in the 1946 clearing with clone TJ.1 planted at intervals as a control. The above summary shows the average growth of the budded material. The trees will be test-tapped from 1953.

1946 Clearing, Legitimate Seedling Trial of 1944 H.P. Seedlings 3¾ Acres Hedigalla

The 1944 hand pollinated seedlings were planted as two year old stumps in August, 1947, in an area left over from the 1946 clearing. Out of a total of 405 seedlings 326 survive at the present time. Girth measurements were taken in September, 1952. The average girth measurements are summarised in Table XII together with the figures for January, 1951. Approximately 21 months increment figures averaging 9.07 inches are very satisfactory. These trees will also be test-tapped in 1953.

TABLE XII

1946 Clearing, 1944 H.P. Seedlings, Hedigalla

Family	No. of trees 1951/52	Mean girth in inches		Increase 1951/52
		Jan. 1951	Sept. 1952	
PB5/139×TKD113	129–126	12.55	22.11	9.56
PB86 × TKD113	39	12.79	22.00	9.21
PB86 × GL1	18–17	11.65	19.03	7.38
PB86 × BR2	23–20	10.67	19.40	8.73
PB86 × MK3/2	12	11.84	20.58	8.74
PB86 × DK5315	8	10.63	18.13	7.50
PB86 × BD10	8	11.91	21.41	9.50
PB86 × PIL.B.84	6	12.38	22.48	10.10
PB86 × PB5/60	7	14.71	22.64	7.93
PB86 × WG6278	5	13.20	21.20	8.00
PB86 × PB5/139	6–5	9.96	21.80	11.84
PB86 × HC28	4	12.72	23.97	11.25
PB86 × AV163	4	11.19	19.66	8.47
PB86 × PB6/50	4	9.78	18.25	8.47
PB86 × TJ.1	3	9.96	18.96	9.00
TKD113 × TJ.1	25	11.21	20.26	9.05
TKD113 × PBS90	14	12.68	21.12	8.44
TKD113 × GL1	10	11.85	20.30	8.45
TKD113 × HC28	1	11.88	22.62	10.74
Total	Mean 326	11.77	20.84	9.07

1947 Clearing, Trial of 5 tree clones, 10½ Acres, Hedigalla

241 five-tree clones established from the 1944 hand pollinated seedlings were planted in this area in Sept–Oct., 1947. Girth measurements taken in January, 1952 and 1953 are summarised under :—

Mean Girth in Inches, 5 Tree Clones from 1944 H.P. Seedlings

Five tree clones	January 1952	January 1953	Increase 1952/53
241	12.69	16.03	3.34

The average girth of trees of 16.03 inches for just over 5 years growth is satisfactory, but not up to normal standards of good growth in the wet low-country districts.

1947 Clearing, Legitimate Seedling Trial of 1945 H.P. Seedlings 29½ Acres, Hedigalla

This area was planted with 3565 stumped hand pollinated seedlings in October, 1947. About 1,300 plants were lost following a severe drought soon after planting. The vacant holes were planted with illegitimate seedlings of clone TJ. 1 and PB. 86 from Dartonfield nurseries. 500 holes were planted with " selfed " seed of clone TJ. 1 from a twenty acre block, two miles away from other rubber plantations. The growth in this area is very satisfactory, and routine attention has been given to cultural operations and manuring in 1952.

1949 Clearing, Large Scale Clone Trial, with Hedge Planting, 34¾ Acres Hedigalla

This area is planted on a hedge planting system with trees spaced 6′ × 45′ giving approximately 160 points per acre. The rows with 6 feet are as far as possible at right angles to the gradient. This method of planting has been very favourably reported on in Indonesia and India, where rubber has been planted with a secondary crop like cocoa, or coffee. 1937/38 plantations in Indonesia gave in the second year of tapping 6 to 7 lbs. per tree per year. Tapping was started in 6 to 7 years, after planting.

This experiment will give the information for ' hedge ' planting under local conditions. There are a number of advantages in this system with regard to tapping tasks, control of disease, establishing and maintaining of cover, provided the rubber grows normally and gives the expected yields for high yielding material. Many estates have in recent years adopted normal rectangular planting as a preliminary to adopting more extreme forms of rectangular planting leading up to " hedge " planting. This system is particularly useful for planting clonal seedlings at a high initial stand, and thinning out in later years. The area was planted in July, 1949, with the following material :—

(*a*) 20 new clones established locally from Prang Besar and Tjikadoe seedlings planted in 1932/33.

(*b*) Clones NAB. 16, 17 and 20 from the 1939 clone trial at Nivitigalakele.

(*c*) Two Dartonfield clones DAR38 and 40 established from two high yielding seedlings of clone MK3/2.

(*d*) Control clones RRI. 501, RRI. 504, RRI. 513, PB. 86, PB. 6/50, LUN. N.

The layout is a balanced incomplete block design with 6 replications of each clone in plots of 25 trees.

Girth measurements taken in January 1951 and 1952 are summarised in Table XIII.

TABLE XIII

1949, Large Scale Clone Trial with Hedge Planting, Hedigalla. Mean Girth in Inches

Clone	Girth		Increase 1952/53
	January 1952	January 1953	
RR19	5.00	8.74	3.74
RR28	6.52	10.99	4.47
RR29	5.45	9.31	3.86
RR30	5.63	9.82	4.19
RR31	6.81	10.31	3.50
RR32	4.29	7.41	3.12
RR33	6.46	10.49	4.03
RR34	4.57	8.03	3.46
RR35	6.23	9.88	3.65
RR37	6.24	9.53	3.29
RR40	6.38	9.47	3.09
RR41	5.22	8.23	3.01
RR42	6.51	10.07	3.56
RR44	5.24	9.09	3.85
RR45	5.46	9.42	3.96
RR46	5.84	9.60	3.76
RR48	6.02	9.47	3.45
RR49	5.80	9.88	4.08
RR50	5.52	9.03	3.51
RR51	5.90	9.61	3.71
NAB16	4.64	7.99	3.35
NAB17	6.20	10.36	4.16
NAB20	6.01	9.90	3.89
DAR38	5.71	9.53	3.82
DAR40	5.96	9.83	3.87
RRIM501	5.29	8.97	3.68
RRIM504	5.99	9.81	3.82
RRIM513	5.85	9.46	3.61
PB86	6.13	9.87	3.74
PB6/50	6.71	10.03	3.32
LUN.N.	4.80	8.44	3.64
Mean	5.75	9.44	3.69

The average growth figures for trees of approximately 3½ years of age is very satisfactory on land, which indicates rather poor soil conditions. A good cover and manuring with a complete mixture has greatly improved the growth of the trees in the past year. Early branching is a characteristic feature in this clearing along the avenues, which helps the trees to girth quickly. The lower branches can be expected to function for a longer period, compared with square planting, where the low branches atrophy about the sixth year of growth for want of sun-light.

Careful observation will be made on the general development of trees with regard to branching, bark characteristics, and wind damage.

1950 Clearing, 3 Clone Trial, 20 Acres, Hedigalla

This area prepared for 1950 south west planting was planted in July, 1951.

The material consists of eight Chaemara clones, one Indo-China clone OE. 1, one new PB clone 9/82, and eighteeen new local clones in the RR and DAR series. The control clones are PB86 and LCB 870. The growth is satisfactory and attention has been given to cultural operations under general estate routine.

1952 New Planting and Replanting.

1952 Clearing, 25 Acres, Hedigalla.

This area was opened in jungle in 1952 and planted with 5 tree clones established from 645 hand polinated seedlings planted in the 1947 clearing at Hedigalla. The planting was carried out in Oct–Nov. of 1952. The bud–grafts have successfully sprouted and the growth is generally satisfactory. Only a few supplies have been used for supplying vacancies. Extra plants have been put out in trenches for use as late supplies.

1952 Replanting, 35 Acres, Dartonfield.

Clones NAB12, 15 and 20, PB86, RRI501 are planted on a large scale for testing on a commercial basis. 200 trees make a plot, which will be used as a tapping task. Each clone is replicated fivefold in a randomised block layout. The extra boundary holes have been planted with NAB 17 which is a high yielder showing early indications of excessive Brown Bast. It is possible that this clone may yield well on a reduced intensity without the bark disease. The experiment provides a final test for the three local clones, against two high yielding control clones PB86 and RRI501. The budwood of the three NAB clones has been distributed for small scale trial on estates.

Budwood Nurseries, Nivitigalakele.

Distribution.

1471 yards of budwood of various new clones were supplied to estates for budwood multiplication and small scale trials.

600 yards of budwood were supplied to the small and middle class holders through the Small Holdings Department.

New local clones.

The following clones were selected from various clone trials at Nivitigalakele and Hedigalla for budwood multiplication for large scale trials in the future :—

From Nivitigalakele — Clones RRI11, 120, 121, 123, 125, 126, 128, 129, 146, RR153, 168, 173.

From Hedigalla — Clones 8/1, 12/8, 27/10, 30/10, 30/23, 9/11 and 7/16

New Foreign Clones.

From Indo-China — IR 7 and IR 10.

From RRIM — 33/51, 33/307, 33/82, 33/52, 33/276, 33/285, 33/308, 33/97, 33/53, 32/588, 32/624, 32/610, 32/615, 32/560, 32/567, 32/568. These are clones established from seedlings of clone PB86 for testing against Oidium leaf disease.

Correspondence	Inward	730
	Outward	599

REPORT OF THE AGRONOMIST FOR THE YEAR 1952

By

D. H. Constable

Staff.

The staff was augmented by the arrival of Mr. T. C. Z. Jayman as Laboratory Assistant on 4th January, 1952. In May we were notified that Mr. Jeevaratnam had been awarded a scholarship for training abroad and that he was accepted by the University of Adelaide and the Waite Agricultural Research Institute and would probably commence his studies in February 1953.

Mr. Jayman was given an abbreviated analysis training similar to that of Mr. Jeevaratnam.

Summary.

On receipt of the news that Mr. Jeevaratnam would be at the R.R.I. for a further nine months, it was decided to bring the period of laboratory training to an end, and to commence work aimed at investigating the nutrient status of rubber, and setting up a laboratory advisory service.

Most of the apparatus required has now arrived. The spectrophotometer was received in March and has proved a most useful tool. Both the assistants are fully conversant with its use, and are carrying out work daily with it.

The flame attachment arrived in June. Certain difficulties have been experienced from time to time with this, and it has been found desirable to switch over to full time use of hydrogen rather than acetylene which appears to cause clogging of the atomiser presumably by carbonisation of impurities. In spite of these difficulties it has been invaluable and it is possible to carry out analyses of Potassium and Sodium normally taking hours in a matter of minutes.

The following considerations are now directing the work of the Agronomy Department. A major need in Ceylon is proper manurial advice, and the diagnosis of fairly wide spread deficiencies (it is relevant to this discussion to point out that we have evidence that the deficiencies are in the macronutrients). The final proof of any manurial work can only rest on field trials, but these in rubber suffer from a number of practical difficulties, the greatest of which is, that test tapping if conducted on outside estates, requires a considerable trained staff and transport facilities if a sufficient number of sample tappings in the year are to be obtained. At present we have not even reached the stage of knowing if a full NPK mixture is desirable, and our views on this point have been confused by the NPK experiment in Dartonfield, the design of which totally confounds clonal differences with block differences, and provides a rather unsatisfactory estimate of error variance therefore. Estate manurial experiments have been established to test the effect of N & K on phosphate manuring (which can safely be considered as essential) for this reason. However no conclusive results can be expected from these for seven years, and if the result then favours an unbalanced mixture the period will have to be greatly prolonged to examine the secondary effects such as bark renewal in particular.

It is therefore essential to develop some means at least of correcting gross deficiencies in the young trees arising as the result of unsuitable fertiliser mixtures for the area concerned. The main possibility lies in foliar diagnosis in which we have the advantage that the effects of fertiliser additions can be

studied step by step by further analyses on the tree, rather than by correlation with a field experiment which in rubber must take several years to give results.

Work has therefore been started on the characterisation of values for the various elements in the foliage of Hevea, Desmodium and Pueraria. Simultaneously preliminary studies have also been made on foliage from estates having deficiency symptoms. Interesting and consistent results have been obtained and small scale experiments have been started on estates to test these results.

In the field work all the estate manurial trials have been established. Lochnagar (Matale), Epping Forest (Horana), Mirishena (Kalutara), Kepitigalla, Ederapola and Degalessa (K.V.), Hewagam (Padukka) and Ambatenne (Kalutara) have been used and in the case of the first three the trial embraces the use of Sodium Nitrate.

At Hedigalla, manurial trials and a restricted spacing trial have been started. Both include a test of LCB.870 and of LCB.870 top-budded on to PB.86, against PB.86.

At Dartonfield only the 19½ acres NPK experiment is still under study. A paper summarising the records and results to date, has been written and finalised with the close co-operation of Mr. G. E. Hodnett of Rothamsted Experimental Station and is due to be published in one of the journals. A review extracting the facts of interest to planters will be published in the Quarterly.

Various analyses have been done during the year on Factory water, sulphur, rubber samples (for nitrogen content) and soils for pH and lime requirement. These services are not generally available, and are only offered when the work has some bearing on our research problems.

Laboratory Work.

The first six months of the year were devoted to the continuation of Mr. Jeevaratnam's course of training and to the instruction of Mr. Jayman in the methods of analyses most used in the work projected.

The spectrophotometer arrived fairly early in the year and was found to be very reliable and simple in operation. The assistant staff have had no trouble in familiarising themselves with its operation. The flame attachment arrived later but gave some trouble due to clogging and variable atomisation, so at present it is operated only by the Agronomist. Part of the troubles appear to be due to carbon deposits and it has been found convenient to go over to Hydrogen in spite of the higher cost and rate of consumption of the latter.

Analyses of Potassium, Sodium, Magnesium and Calcium are all being done by flame photometry. The calcium results have proved of interest as they have been low (50%) in comparison with volumetric (oxalate) figures. This is almost certainly due to aluminium, and suggests a high leaf content of the latter. This correlates with the excessive acidity that has been found on many soils, and may be a contributory factor to the deficiency symptoms.

At present we are carrying out the following analyses : Nitrogen by Kjeldahl and distillation into Boric acid (Winkler's modification), Phosphorus by phospho–vanado molybdate, Potash by flame photometry, Calcium by oxalate volumetrically, Magnesium by flame and 8–Hydroxyquinoline (colorimetrically), Sodium by flame, Iron by Thioglycollate (colorimetrically) and Manganese by Permanganate (colorimetrically). It is hoped to determine Aluminium by the variation of the Calcium flame from its true intensity.

We have also had under test a method of separation and estimation for Iron, Calcium and Manganese which appears to hold out promise.

The solution is buffered to pH 4.5 with ammonium acetate and 8–hydroxyquinoline added. The precipitated iron and heavy metals are dissolved in chloroform after filtering and the iron determined by its absorbance at 550–600 mp. Calcium is determined on the filtrate by treatment with ammonium oxalate still at pH 4.5. The filtrate is then heated and the pH brought above 9 by addition of excess of ammonia. The precipitated magnesium 8-hydroxyquinolate is washed with chloroform and dissolved in hot dilute hydrochloric acid and its absorbance at 365 mp determined. The only drawback to this method is the possibility of incomplete precipitation of magnesium hydroxyquinolate in the presence of ammonium oxalate.

At present the leaf sample solutions are being obtained by wet digestion of the oven dry material with nitric, perchloric and sulphuric acids.

Using these methods, characteristic values have been obtained for each of six clones of Hevea, utilising material from our older budwood nurseries. There appear to be significant clonal differences in the N and K percentages based on the standard error of samples from ten separate trees per clone. This may however, equally be a soil difference. Values for Desmodium samples were obtained utilising samples from the NPK experimental plots. Evidence of a positive phosphate effect on nitrogen and phosphorus percentages was obtained. Pueraria samples from the same area have been taken but not as yet in sufficient quantities to justify any conclusions.

All this work will be reported at length in the Quarterly or other appropriate journals.

Using these results, analyses were undertaken on eight estates all having pronounced leaf symptoms, and in some cases decidedly backward growth. As convenient, samples were taken from all or some of the three different plant species. In all, some twenty one different sets have been taken and in only three of the cases did Potash approach normal, the general value being 25% normal. In the case of nitrogen some six samples gave normal nitrogen results and the remainder 50–75% normal. The remaining elements appeared normal with the possible exception of Sodium which has not been characterised as yet, and a general tendency on the part of Calcium to exhibit the normal Ca/K–antagonism effect.

Both sampling and analysis of these deficient areas were contemporary with that on the " standard " samples so there is no reason to suspect a seasonal effect. On the first two deficient areas investigated, the results were naturally under suspicion, and a second more thorough sampling was undertaken some six weeks later. The two sets of results (for the same area) were in full agreement, as were the samples amongst themselves.

This potash-nitrogen shortage is most unexpected and therefore we are placing small experiments on these estates to test out the effects of higher applications of these two elements. It must be emphasised that the conclusions are at the present purely speculative, as our " standard " trees (budwood nurseries at Nivitigalakele) may be overmanured and exhibiting " luxury consumption " figures. On the other hand a 400% luxury consumption is unlikely, and our figures for Potash are in agreement with Dyck, Hahn and Chapman, and for nitrogen with Chapman. Moreover, as noted above, we have in a certain number of cases obtained percentage figures in full agreement with our own

tentative standards from the outside samples. During 1953 we are going to get leaf samples from the three highest yielding estates for any one given clone, which we hope will give more reliable standard figures and a better estimate of the sample variance. We also propose to study on one or more areas the seasonal variation in leaf nutrient content. For this purpose and for studying the effects of fertilisers, our estate manurial trials will be particularly suitable though unfortunately they do not cover a range of clones.

We consider that there may be two factors contributing to this shortage of major nutrients : Firstly, it has only just come to the author's knowledge that R215 (3 : 4 : 1 : : $N : P_2O_5 : K_2O$) represents not a recommended mixture of the R.R.I. but the proportioning of the available fertiliser shipped to Ceylon during the last war. Unless there is considerable potash in Ceylon soils, a point which has been adversely commented on by Joachim and his collaborators, there seems to be a *prima facie* case for increasing the muriate of potash content of R215 from 15 to 50 lbs. and making an R250 mixture* (4 : 6 : 5 : : $N : P_2O_5 : K_2O$).

The second factor is the combination of highly porous soils, and heavy unpredictable rainfall, which makes it appear likely that much of the soluble fertiliser (potash and nitrogen) may be washed away before the plant can utilise it.

On deficient areas therefore, we are recommending small monthly applications of fertilisers from March to October inclusive. The period November–February is avoided as "wintering" may be affected with a consequent increase in Oidium susceptibility. This recommendation we are also tentatively advancing to the general community as an idea for their consideration, in which form it is being well received.

During the latter half of the year we received a very robust and portable pH meter, and simultaneously with our foliar analyses, we have been checking the acidity of the soil and its lime requirement. The latter was carried out electrometrically with saturated $Ca(OH)_2$ allowing a 24 hour standing period and a final pH of 6.5. With one exception the pH values (1 : 1 water suspension) were found to be below 5 and frequently below 4.5. On one area manured 3 months previously with sulphate of ammonia alone the pH was 3.9 and it was particularly noticeable that no regeneration of Pueraria onto the manured strips had taken place. The area giving pH values over 5, was one of those deficient in Potash and Nitrogen, and had for a number of years received only Saphos (rock) Phosphate, and had just recently been put back onto R215 which, incidentally, was being applied once a year to a soil with 50–65% of its particles over 2 mm. in diameter. It should be noted that these soils are 80 to 90% coarse fraction, much of which is gravel or concretions, while the clay appears to be kaolinitic and cation exchange capacities of less than 1 me. per 100 gms. are to be expected. This acidity then represents the probable limit for a light soil and shows an almost complete loss of bases. This point has been particulaly mentioned as it has been suggested by the L.A.C. that we should investigate the possible effect of sulphur dusting on soil acidity. To date we have carried out a laboratory check based as follows : The maximum application of sulphur is 100 lbs. per acre–per season. Assuming complete return to earth and 100% conversion to sulphuric acid, this is equal to 300 lbs. of sulphuric acid per acre *i.e.*, 150 p.p.m. (to 6" soil depth). 100 grams of soil were therefore taken, and 100 ml. of water added and the pH determined after thorough stirring. 3 ml. of N/10 H_2SO_4 (= .015 gms. H_2SO_4) were added, and the pH determined immediately and after 48 hours. Results are shown in Table I.

* Preferably called R4 : 6 : 5

Soil pH – Laboratory Test of Sulphur Addition

Soil No.	pH before acidifying	pH after acid addition	pH after 48 hours	Original field pH
1	4.9	3.6	4.2	4.6
2	4.7	3.6	4.2	4.7
3	4.1	3.7	4.0	4.0
4	5.6	4.9	5.4	5.8
5	4.8	3.5	4.4	5.0

It seems likely that there is a tendency towards a limiting value at approximately pH 4.0 which one would expect on light sandy soils and particularly those with free iron in the form of concretions. It should be noted that the amount of acid added represents the maximum possible, allowing 100% recovery and no removal from soil. Apart from questions of recovery it must be noted that actual applications are only 10 lbs. per acre and the application of 100 lbs. may take 10 weeks. It seems improbable that sulphur dusting will have as much effect as the annual addition of at least 100 lbs. per acre of sulphate of ammonia (or 290 lbs. per acre using the R400 mixture).

During this coming season it is proposed to study soil pH on one of the estates receiving experimental sulphur dusting treatments under the Mycologist's supervision to see what, if any, effects may be found.

In all those estates having deficiency symptoms, and in which the average soil pH is less than 5, the experiments laid down to test the effect of N and K are crossed by liming strips at rates of nil, one half, and the full value given, for liming to pH 6.5, by the laboratory tests.

No other work apart from some preliminary tests, has been done on soil analysis because of the weight of evidence showing the small base content and because of the difficulty of sampling soil to the depths utilised by the tree. It is to be noticed that the soil nutrients appear to be sufficient for about 50% normal growth of the tree.

This statement is based on requests for diagnosis and advice received from small estates which have used no fertiliser whatsoever. It is a common feature of these requests that it has taken some 12 years to get the trees to tappable girth, and that within two to three years of tapping the trees are in a very bad state.

This limitation may of course be due to the shortage of one element only, in which case phosphorus appears to be the most probable choice. If time etc., permits we may investigate some of these cases further by analysis, with a view to using them as a form of Neubauer experiment.

Finally, in the foliar diagnosis programme, we are raising pot plants in gravel with restricted nutrient supplies. To date we have not yet obtained consistent leaf symptoms, and there is nothing further to report here.

The remaining investigations undertaken by the laboratory, comprised some Factory water analyses for the Chemist as in 1951, some sulphur analyses (for total S content) and some total Nitrogen on latex crepe at the request of the Latex Corporation through the Chemist.

In all 2,100 analyses covering N, P, K, Ca, Mg, Na, Fe, and Mn were performed on 278 plant samples, and some 30 water etc., samples in the course of the last 6 months.

Field Experiments.

During the year all the estate experiments were got under way. The general form of the trial was one of Nil, P, PN, PK and NPK, it being considered that the necessity for phosphate was sufficiently proved to eliminate the need for a full N × P × K trial. The layouts will be described in slightly more detail later, but in general the intention was to establish a 5 × 5 Latin Square layout.

Otherwise with two exceptions, a five block randomised layout was used following the order of plots worked out for a Latin square.

In three of the trials Sodium Nitrate was included by splitting the nitrogen plots in two. The estates used for this trial were using avenue planting which permitted the plot splitting. No guard trees were generally possible in any of the estates owing to the area available and its shape. The spacing of trees is fairly wide however and it is unlikely that poaching will take place under 6–7 years old. By this time we should have sufficient girth figures to provide a satisfactory estimate of treatment effects on tree growth.

The detailed description of the trials is given herewith :—

Lochnagar.— 5 × 5 Latin Square incorporating Sodium Nitrate in split N plots. Total Area 700 trees spacing 6′ × 50′ Kepitigalla Polyclone Seed. Each plot consists of 2 rows of 14 trees per row.

Kepitigalla.— 5 × 5 Latin Square. Total Area 625 trees spacing 20′ × 12, Kepitigalla Polyclone Seed. Each plot consisting of 5 rows of 5 trees.

Ederapolla.—Nil, P, and NPK only in contour rows of 50 trees per row per treatment. 6 replications. PB86 buddings intended to be top budded with LCB870. All the land in this area is very steep and the trial had to be modified therefore.

Degalessa.— 4 × 5 Randomised block layout. Total Area 1,020 trees spacing 30′ × 8′. PB86 buddings. Each plot consists of 3 rows of 17 trees per row.

Hewagam.— 5 × 5 Randomised Blocks in Latin Square order Sodium Nitrate in split N plots. Total Area 500 trees spacing 10′ × 30′. WG6278 buddings. Each plot consists of two rows, of 10 trees per row. Lining is straight up and down hill along smooth slope.

Epping Forest.— 5 × 5 Latin Square. Total Area 625 trees spacing 20′ × 10′. PB 86 Buddings. Each plot consists of 5 rows of 5 trees.

Ambatenne.— 5 × 5 Randomised Blocks in Latin Square order 12′ × 20′ Total Area 1,125 trees. KPC Seedling. Each plot consists of 3 rows of 15 trees.

Mirishena.— 4 × 5 Randomised Blocks. Sodium Nitrate in split N plots 15′ × 18′. Total area 3,000 trees. Each plot consists of 3 rows of 50 trees. N plots are split into halves giving 3 rows of 25 trees to Sulphate of Ammonia and the same to Nitrate of Soda. Gl1 Buddings.

The present standard rates of application are 10 ozs. Sulphate of Ammonia and/or 8 ozs. Saphos Phosphate and/or 4 ozs. Muriate of Potash (50%) and or 12 ozs. Nitrate of Soda per tree twice a year. In accordance with our changing views on the importance of frequent applications, it has been decided to apply half these quantities in each of the months March, May, August and October each year.

We would prefer eight monthly applications over the same period, but are restricted by considerations of staff. At the rate of two estates per week, a complete manuring round takes one month, and would necessitate the full time provision of a field attendant with no other duties during eight months of the year but supervision of manuring.

Field Experiments — Hedigalla.

During the year the trial of five clones with a restricted set of five planting densities from 110–220 points per acre was started. The clones used are PB86, PB86 top budded with LCB870, LCB870, AV255, and Kepitigalla Polyclone Seed. The layout is that of two blocks each having the five spacings. Across these are placed the five clones in randomised order, the entire trial occupying some 13 acres.

A similar trial to that of the estates was also laid down for fertilisers. A 5×5 Latin Square was utilised, and each plot was split into four, each sub-plot being given to one of the clones PB86, PB86 top budded LCB870, LCB870 and AV255.

Considerable difficulty was experienced in laying out this trial, due to the configuration of the ground and to the presence of large masses of slab rock frequently thinly disguised by a layer of soil.

It is considered that the area is only suitable for trials in which regularity of plots and plot sizes is not of paramount importance to the production of reliable results. A memo to this effect has been submitted with particular reference to the proposed 1953 Agronomy planting programme.

In this connection also, it is not out of place to point out that the establishment of statistical layouts according to accepted principles, is not a simple matter in these conditions. The requirements of sample tapping, and the standard of field labour, make it highly desirable that the main interest in any set of treatments should be concentrated into the largest size of plot. Hence the use of split plots rather than separate combinations of every factor under review. It is for this reason also that the unusual step has been taken of assigning the most important effects to whole plots instead of to the split plots.

Field Experiments — Dartonfield.

Only the 19½ acre 1938 clearing NPK experiment is now under observation. The long term results for this have been summarised in co-operation with Rothamstead and are to be offered to the Empire Journal of Experimental Agriculture. A synopsis will be published in the Quarterly at an early date.

The results for the year 1952 are given in Tables 2, 4 and explanatory Tables in 3 and 5.

In Table 2 we have the average girth in inches for each of the clones under each treatment together with the average results for clones and treatments.

In Table 3 there is in (*a*) the order of merit of treatments ; these figures have a significant difference of better than 1 in 100 and the test of 3 times the standard error ($=3 \times .33'' = 1.0''$ approx.) can be applied. This shows the treatments to be divided into two groups as shown by the lines_____. Also within the top group, Compost has proved significantly better than P or PK. In the lower group NK verges upon being better than the other three treatments, and K is worse than NK and N.

Under (*b*) are the means of the treatments with and without P, N and K respectively. These are significant and a value of three times the standard error (=3 × .16 = .50″ approx.) can again be applied.

TABLE II

Average Girths in Inches of Trees in NPK Experiment 1938 Clearing. 1952

	TJ.1	PB.183	W.259	HC.28	PB.86	PB.186	Average
O	25.3	23.5	29.0	26.9	24.1	22.5	25.2
N	23.4	24.2	26.8	26.6	25.5	27.5	25.7
P	27.6	29.2	28.7	28.1	29.2	25.8	28.1
K	21.7	24.2	25.6	29.5	25.0	20.1	24.4
NP	27.4	28.2	29.6	29.5	27.5	28.6	28.5
NK	25.7	24.2	24.2	29.1	26.2	30.7	26.6
PK	26.8	28.8	27.7	31.0	26.4	27.2	28.0
NPK	26.5	27.9	28.3	31.5	29.5	28.4	28.7
Compost	29.8	28.9	26.6	29.6	29.8	31.4	29.4
Average	26.0	26.6	27.3	29.1	27.0	26.7	

TABLE III

Girth effects and averages from Table II

(a) Order of Merit

Compost	29.4″ S.E. of means of 6 = ± .33″
NPK	28.7
NP	28.5
P	28.0
PK	28.0
NK	26.6
N	25.7
O	25.2
K	24.4

(b) Treatment main effects means

No. P	25.4″ S.E. of means of
P	28.3″ 24 = ± .16″
No. N	26.4″
N	27.4″
No. K	26.9″
K	26.9″

TABLE IV

Average Yield in lbs. per acre per annum in the NPK Experiment 1938 Clearing – 1952

	TJ.1	PB.183	W.259	HC.28	PB.86	PB.186	Average
O	518	396	737	571	812	587	604
N	393	651	446	530	912	707	607
P	735	682	537	594	931	763	707
K	541	432	253	541	811	581	526
NP	947	380	351	571	995	760	667
NK	762	409	349	498	813	763	599
PK	614	758	477	583	787	693	652
NPK	832	500	469	524	904	772	646
Compost	543	884	423	387	808	835	647
Average	654	566	449	533	864	711	628

TABLE V

Yield effects and averages from Table IV

(a) Order of Merit		(b) Treatment effects Means	
P	707 lbs/acre. S.E. of mean of 6 = ± 53 lbs/acre	No. P	584 lbs/acre. S.E. of mean of 24 = ± 27 lbs/acre
NP	667	P	673
PK	652		
Compost	647	No. N	622
NPK	646	N	635
N	607		
O	604	No. K	646
NK	599	K	612
K	526		

This shows the phosphate effect of 3″ better girth to be, very significant, and that of N *i.e.*, 1″ better girth, to be significant, No. K effect has been shown.

Some care must be taken in analysing these results for practical recommendations. Firstly, it should be noted that parallel results are not obtained with the yield figures, where only the Phosphate main effect has proved significant and at about 1 in 40 level only. This is probably due to the difficulties of yield sampling which cannot be very precise. It is probably reasonable to say that even given the same yields from both treatments the one that gives better girths is definitely preferable, and may on long term considerations be essential. In considering the apparently non existent K effect, it should be noted that the K effect is variable. Alone it is definitely negative, on P it has not much effect and it raises the value of N alone. Considering therefore also our results gained in foliar analysis it is likely that the question of Potash manuring has to be treated individually on its merits.

Passing to the yield figures these are given in Table 4 and the order of merit etc. in Table 5. Actually there is no significance in the individual treatments and therefore the order of merit is not of importance. However when placed in this order all the phosphate contained treatments appear in the upper half of the table, and a test of the treatment main effects shows the phosphate difference of 89 lbs./acre to be significant at a level of about 1 in 40. The lack of apparent results may also be due to the anomalous results given by the clone W. 259 with a no fertiliser value of 737 lbs./acre as against an average 450 lbs./acre with any of the fertilisers. It has been thought that the nil plot was a "rogue" but this is not so and the only explanation is that the contour planting has resulted in this plot being nearly double the size of the others. Elimination of this clone increases the phosphate effect to 105 lbs. per acre with a significance better than 1 in 100 and has no other effect.

Advisory Work.

This continues to be a heavy drain on the time of the Department. It is a regrettable fact, that much of it is due to small proprietors ignoring the principles of good agriculture and the advice of the Institute, until the plantings are so maltreated as to be valueless. Our standard answer is to recommend immediate replanting and attention to the advisory Circulars in future, or as an alternative, for which we can take no responsibility, to manure with a mixture such as R250 at the rate of 1 lb. per tree per month from March to October inclusive each year, for at least two years in an attempt to supply the nutrition so long witheld.

Apart from this, one, of the major problems during the year has been the improvement of trees very badly affected by Oidium. Blocks of rubber up to 50 acres in extent, have had to be taken out of tapping during the year, owing to the continuing defoliation following on the severe attack experienced in practically all areas this year. Here again our general advice has been to manure with small quantities (circa $\frac{1}{4}$ lb. per tree per application) of a balanced mixture such as R250 at monthly or even more frequent intervals. In certain cases the extreme state of the trees has rendered it worth while continuing the manuring even into the wintering period in order to raise the nutritional status of the trees to the highest possible level.

During the year in co-operation with the other departments the revision of Circular No. 13 (since issued as No. 35) and No. 4 were undertaken. A further circular on manuring is under active consideration.

General.

The attention of the Board must be drawn to the fact that with Mr. Jeevaratnam's departure early in 1953 for two or three years, there will only be one assistant working in the laboratory and, that, taking leave and sickness into consideration, there will be appreciable periods when no work is being done in the laboratory. The Agronomist's programme of visits, field work and advisory work leaves little time for personal laboratory work of any sort, and no time for systematic routine research work, all of which routine work must be done by assistants. There seems little point in extending our facilities, by extra building, if there are no staff to use these facilities. I would strongly recommend therefore, the recruitment of one, and preferably two assistants of H.S.C. or University Preliminary Standard if the expansion in facilities and equipment made by the Board are to be usefully employed. This will still be the case on Mr. Jeeveratnam's return for then, instead of being employed on routine work for the Agronomist as at present, he will be qualified to undertake an independent research problem, and will need an assistant, preferably trained, to undertake part of the routine analysis work involved.

The question of a second field attendant should also be considered as the whole field work internal and external is concentrated in one man and his sickness, absence on leave, or departure means that continuity of work is completely lost. The work of the present attendant comprises : monthly supervision of test tapping 19½ acres Dartonfield. Three monthly supervision of manuring on Dartonfield, Hedigalla 1952 Clearings, and on eight estates. Girth measurements once a year on *all* trees in all experiments.

It has not been found possible to commence ladder tapping or stimulex experiments on the 1936 and 1941 clearings this year as the area though finished with by the Agronomist, still had some records to be taken by the Botanist. It is hoped that if field supervision is available this can be started in 1953.

During the year, eighteen visits were paid to Estates to supervise manurial experiment applications and twenty three for advisory purposes. Eight estates have manurial experiments ; one of these, and a further five estates have deficiency trials established or in preparation, two estates are under special manurial treatment for severe Oidium after effects, and two under investigation for troubles occurring in nursery plants.

Lectures were given to the Southern Planters' Association and to the Sabaragamuwa P.A. on the Agronomy programme and the problems

confronting the work proposed. Considerable interest was shown judging by the number of questions following each lecture.

Correspondence :

Inward	272
Outward	319

Rubber Research Institute of Ceylon,
Dartonfield,
Agalawatta.
21st January, 1953.

REPORT OF THE MYCOLOGIST FOR THE YEAR 1952

By

Ir. J. H. Van Emden

1. Staff.

Ir J. H. Van Emden was on duty throughout the year and also acted for the Botanist from May 1st till November 1st.

Mr. D. M. Fernando was away on a Technical Aid Scholarship for training in plant pathology at the Mac Gill University in Canada.

Mr. M. D. David took up duties as a laboratory assistant on January 2nd.

2. General.

Four Planters' Association meetings were attended and two demonstrations of sulphur dusting and sulphur dusting machinery were arranged.

Sixty five Estates (other than R.R.I.) were visited.

Correspondence :

	Inward	*Outward*
	1085	1032
Samples of diseased material examined	30	
Samples of sulphur analysed	101	

3. Oidium.

3. 1. Climate.

According to R.R.I. records, rainfall was about 40 inches below average. The South West Monsoon was early and light. July and August were very dry whereas the first half of October was extremely wet. In the second half of October and during the whole of November the rainfall was again well below normal, but December had a rainfall of 50% above average.

Rainfall in Inches

	1951	*Average*
November	17.80	18.55
December	5.03	10.58

	1952	*Average*
January	5.03	7.25
February	8.49	5.52
March	6.63	10.01
April	11.69	13.36
May	18.00	26.92
June	13.69	17.44
July	3.46	12.67
August	6.92	11.04
September	8.70	15.36
October	19.08	18.79
November	12.30	18.55
December	15.99	10.58
Total	129.98	167.49

3. 2. General Observations.

As December was very dry, wintering started early and Oidium was in evidence wherever young leaves were present. The infection increased in severity until April, when the beginning of the South West Monsoon virtually ended further spread of the disease. Unlike most years, the early wintering clones were badly affected, whereas the late winterers escaped lightly. In each field however the early wintering individuals were less heavily infected than the later wintering trees.

In August Oidium was again almost universally present in nurseries and on young shoots in the field, however without causing leaf–fall. The dry weather in July and August caused some clearings of BD5 to start wintering in September. These fields began to refoliate in October and benefited from the rain. The estates which seized the opportunity to start disease control immediately after the rains stopped, were rewarded with a healthy canopy in fields which had been poor for the last years. The alternating periods of drought and rain demonstrated clearly, how the fields react almost immediately upon rainfall in such a manner, that the wintering of trees, which have not yet started to change colour, is postponed by a few inches of rain. This indicates, that the soil has a very low waterholding capacity. This condition, caused by the configuaration of the land and by the advanced stage of weathering of the soil is an important factor in the Oidium problem.

Although mildew was severe, most clones made a good recovery in May and June, which must probably be attributed to the light S.W. Monsoon, which provided plenty of sunshine.

This recovery did not occur in the higher areas and in exposed fields and a number of clearings were seen which remained virtually leafless throughout the year. In such fields die–back due to diplodia was severe. Trees were seen which had died back to the tapping panel or even lower.

3. 3. Sulphur.

During the end of 1951 and the first half of 1952 there was virtually no sulphur obtainable. Fortunately the supply position became much better during the second half of the year and most estates have been able to buy sufficient sulphur of reasonable quality.

A large number of samples was submitted to the R.R.I. for examination. Mechanical analysis of these samples and the ensuing correspondence took up so much of the mycologist's time, that it became necessary for the Rubber

Research Board to rule that no further analysis of sulphur samples could be undertaken for the trade.

The dusting sulphur now available falls into three categories.

(1) Ordinary ground sulphur, made free-flowing by addition of fillers; sulphur content 85%–95%.

(2) " Industrial sulphur," a by-product of an industrial process ; sulphur content 40%–50%.

(3) " Redispersable sulphur " in which the primary particles are of colloidal dimensions, but are agglomerated to larger corpuscules more suitable for dusting than the extremely small primary particles.

As all previous experience with control of mildew in Rubber was gained with sulphur powders belonging to group (1), there is for the time being no experimental basis for advice as to the rate of application of powders from groups (2) and (3).

For the "industrial sulphur"—preparations the manufacturers claim, that the fungicidal effect is at least as good as the effect of yellow sulphur on a weight for weight basis, even though the sulphur content is much lower. These claims are based on the assumption that the sulphur in the powders concerned is more " active," due to the darker colour of the material. Experimental results gained in temperate climates seem to support these claims. It is however the author's opinion, that those results obtained in temperate climates are not a safe basis for advice pertaining to the control of powdery mildew under tropical conditions, due to the difference in climate and in rate of application. In this connection it should be kept in mind that the rate of application in Hevea is only 12 lbs/acre/round and also that the tropical climate, with its higher temperature and humidity should be extremely favourable for whatever chemical reactions are involved in fungicidal action of the elemental sulphur.

For the time being it was considered suitable to base the rate of application for all kinds of dusting sulphur on sulphur content and fineness only.

The " redispersable sulphur " is said to be more active than ordinary ground sulphur, due to the extreme fineness of the primary particles into which the sulphur on the leaves is said to disintegrate immediately upon contact with water.

3. 4. Dusting Trials.

Due to lack of dusting sulphur during the 1951–1952 Oidium season no large scale trials were carried out at the R.R.I. The only product on the market was a brown coloured " industrial sulphur " with a low sulphur content and a large coarse fraction. Used at a rate of application of 25 lbs/acre for 6 rounds it gave a reasonable control of Oidium.

With regard to dusting as generally carried out on estates, the author was struck by the fact, that the general recommendations regarding application of fungicidal dusts, *i.e.*, (*a*) to dust in the absence of wind and (*b*) to apply the dust when the leaves are still moist with dew, were usually completely disregarded.

It was found to be the general practice, not to commence dusting until after 9 a.m., when there would be sufficient wind to carry the dust upwards and through the field. The prevailing opinion amongst planters was, that it was impossible to blow the dust high enough and to get the necessary depth of penetration with the existing machinery without the aid of wind.

In order to investigate these points, experiments in dusting technique were carried out. In these experiments which were done before as well as after sunrise, the dust was trapped on slides suspended from hydrogen balloons. It was found, that both the " Noidium " and the " Whirlwind " were powerful enough to blow the dust to a height of more than 80 ft. in the absence of wind, even when the machine was moved at a speed of 2 miles per hour. In still air the dust was found to drift laterally to about 100 ft. if the outlet was tilted about 30 degrees from vertical.

A hardly noticeable cross wind increased the lateral displacement to about 200 feet.

It was found furthermore, that a light wind of about four m.p.h., reduced the height directly obtained with the machines mentioned above to about 30 feet. If such a wind occurred between 8 and 9 a.m. the dust was blown away horizontally and settled later on the ground, if it occurred later in the day the dust was carried upward by convection currents, often reaching tree top level at a distance of between 200 and 300 ft., from the machine. Based on the results obtained, the following recommendations were issued.

(*a*) Dusting should start as early in the morning as possible.

(*b*) Dusting should be stopped as soon as the windspeed exceeds two to four m.p.h.

(*c*) When dusting a field, the machine should be moved along more or less parallel lines about a hundred feet apart. In the absence of wind the speed should not exceed two miles per hour. In the presence of wind, the machine should only be moved in the same direction as the wind, or across the wind, never against it.

If these instructions are followed, the fields will be adequately treated with the dust, provided the machine runs at the correct speed (2200–2400 r.p.m.) and the dust is of good quality.

In order to be able to move the machine along parallel lines about 100 ft. apart, it may be necessary to clear additional paths through the field. In this connection it should be realised, that proper supervision of the dusting and satisfactory manipulation of the machine is not possible while the machine is being carried over rough ground.

In the field, the most satisfactory method of directing the dusting operation was found to be, walking about 30 to 50 yards ahead of the machine, from which position one can see where the cloud of sulphur goes. Instructions to the man controlling the machine can be signalled by a set of prearranged gestures.

3. 5. Spraying Experiments.

Prompted by the shortage of dusting sulphur and by the many complaints about the lack of control by dusting, experiments in spraying were undertaken. For this purpose a low-volume spraying machine, the " Micron–sprayer " was made available to the Institute by the Agents, Messrs. Walker Sons & Co., The machine was received too late in the season to do a proper Oidium control experiment with it. However individual late wintering trees at Nivitigalakele were treated and the new leaves were adequately protected. On a neighbouring estate a few strips of PilB.84 which was undergoing its third Oidium attack were treated. The effect was not spectacular, but a difference in favour of the sprayed strips could be seen.

Experiments in which the spray was trapped on glass slides suspended from balloons, showed that the spray reached a height of 80 feet in still air, if the machine was moved past the slides at a speed of 2 m.p.h.

The performance of the machine under trial was found sufficient for experimental work and it was decided to purchase a " Micron-sprayer " for such purposes. The model under trial was however considered to be too cumbersome for use in the field, and a later model of smaller dimensions and less weight but powered with the same engine and of the same capacity was ordered. This machine weighs 5 cwt. It is mounted on a trailer with an overall width of 42 inches.

With this sprayer an experiment was started in December. The purpose of which is, to compare the degree of control obtained by spraying with the degree of control obtained by dusting. Should it be found that spraying of lime sulphur or wettable sulphur gives a much greater degree of control than dusting it will be worth while to investigate how spraying could be applied to at least part of the Ceylon rubber area. Under existing conditions, low volume spraying must be considered quite impracticable due to lack of the necessary roads.

3. 6. Dusting Equipment.

The machine now universally used for sulphur dusting is the " Noidium " machine manufactured by Messrs. Colombo Commercial Company Ltd., Colombo. This machine is either powered by a four stroke or by a two stroke Villiers engine. The two stroke engines are gradually being replaced by four stroke engines, as the former type is found to be less reliable than the latter. The trouble experienced appears to be due to overheating. The later types of the Noidium machines are fitted with the so-called " all directional duct " incorporating two ninety degree bends in the duct. Although a certain degree of mobility of the outlet is highly desirable, the ninety degree bends are not considered indispensable. Two 45 degree bends would obstruct the passage of air to a much lesser extent and would still allow the outlet to be pointed into every direction and to assume any elevation above the horizontal position.

Another type of machine which is fairly commonly used for dusting rubber is the " Whirlwind " imported by Messrs. Harrison Lister, Colombo. These machines are either powered by Briggs and Stratton engines or by J.A.P. engines. For dusting with sulphur the performance is about the same as the performance of the Noidium machine.

A serious defect of all dusting machinery in use in rubber is the irregularity of output. A system providing a positive feed, preferably incorporating a metering system would be a great improvement ; suggestions to this effect have been made to manufacturers and importers. During 1952 two prototypes of dusting machines, weighing about 1 cwt. were demonstrated at the Institute. The results suggest, that in future much lighter machinery than used at present may become available.

3. 7. Spraying Equipment.

The only low volume spraying machine available for our purpose seems to be the " Micron Sprayer." This machine is powered with a 5 H.P. B.S.A. engine. The maximum output is two gallons per minute. For use on rubber the output should however be kept well below one gallon per minute as with the greater output too many coarse droplets are formed which do not reach the desired height.

The machine weighs 5 cwt. and is mounted on a two wheeled trolley. The overall width is 42 inches. If roads are available this machine can spray 5 acres of rubber per hour. This low acreage is caused by the fact that the depth of penetration is not more than two rows. Although the machine has given satisfactory service up till now and is well suited for spraying on an experimental scale, it appears that for spraying on estate scale a more powerful machine would be needed.

3. 8. Aerial Spraying.

This matter was considered a few years ago by the R.R.I. and the conclusion arrived at was that with the use of helicopter aircraft application would be too expensive to be of practical value.

During 1952 an offer was made to the R.R.I. by a large spraying contracting firm in U.K. to spray at least 10,000 acres of rubber at a cost of between Rs. 10/– and Rs. 20/– per acre per application exclusive of the cost of the fungicides to be used. In this connection it should be mentioned that the present cost of dusting as carried out on estates is below one rupee per acre per application, which shows that a large amount of money could be spent to improve the technique of ground dusting before the level of expense of aerial spraying will be reached.

A second offer was made to the Institute by another firm in which a small experiment in aerial spraying was suggested to be carried out with small fixed wing aircraft, at the expense of the said firm. This was agreed upon and an area was selected in the Kalutara district.

During the preparations for this experiment it became clear that marking the lanes to be flown by the aircraft will constitute a major problem for which no practical solution has been found as yet. The use of baloons filled with hydrogen in a possibility but too expensive to be considered for use on estate scale.

Apart from this technical problem there are many reasons why aerial spraying of Ceylon rubber is no simple matter at all. Apart from the configuaration of the land there is the fact that the bulk of Ceylon's budded rubber is made up by a patchwork of small clearings of different clones below 50 acres in size. Wintering time of clones is usually different by as much as a few weeks, in extreme cases even a few months. Moreover, if the same clone is planted on a slope, the top part of the clearing may winter two weeks ahead of the bottom part. Aerial treatment will be greatly complicated if an attempt is made to cover each part of a field at the suitable time. The alternative would be to treat a suitably sized acreage when the bulk of it is ready. It is clear however that such a procedure must lead to either a considerable waste of material or a sacrifice in efficiency of disease control.

3. 9. Breeding for Resistance.

The following cross pollinations were carried out on LCB 870.

	Male parent	*No. of pollinations*	*No. of successes*	*No. of seeds obtained*	*No. of seed germinated*
Kepitigalla	PR.107	108	32	87	55
	MK.3/2	13	2	6	5
Dartonfield	LCB.870	113	2	6	3
	NAB.20	238	28	83	65
	PR.107	183	23	69	36
	AV.255	94	6	18	4
	PB.86	103	14	57	23
	MK.3/2	50	18	36	26
	NAB.11	132	8	23	17
	NAB.12	65	9	27	20
		1099	142	412	254

Besides, 1076 illegitimate LCB870 seeds were put out in the nursery of which 800 germinated.

Since the LCB870 plot at Kepitigalla was not dusted in order to observe the effect of mildew on the foliage the number of flowers available for cross pollination was very small as most flowers fell victim to Oidium.

The seedlings of the 1951 campaign were periodically observed. It was found that not a single plant was immune, but there are certainly great differences in susceptibility. As LCB870 is frequently attacked by Oidium, this result was to be expected.

These plants have been put out into the field, closely spaced along the contours, where they will be kept under observation for disease resistance as well as for yield.

3. 10. Clone Museum

During 1951 it became clear that of all the clones planted in the Clone Museum only LCB870 showed a normal and satisfactory development, while all other clones suffered severely from Oidium and were badly stunted in growth.

The result of a growth census taken prior to uprooting is represented below.

Clone	*Total trees*	*Average girth ins.*
AV.152	18	17
AV.163	21	16
AV.214	24	18
AV.255	25	24
PB.86	25	20
HC.55	23	18
BD.2	21	17
BD.17	18	18
PR.105	24	14
AV.256	23	21
AV.352	25	18
PB.23	27	18
PR.107(LCB.510)	27	22
PR.106	25	22
SREKO.9	25	23
WAG.6278	25	19
KD.1	26	18
BD.10	11	17
TJIR.1	10	13
AVROS.50	13	13
BR.2	24	23
PIL.B/84	27	21
HC.28	24	26
PB.25	24	15
BR.1	25	13
BD.5	21	9
PB.24	25	16
RUB.393	21	14
LCB.870	*24*	*32*
TJIR.8	24	17

Clone	*Total trees*	*Average girth ins.*
GL.1	23	16
TK.26	25	15
DBK.1	25	17
TJIR.16	19	18
WAR.4	24	18
PB.183	26	15
AV.157	25	16
AV.49	25	14
DJAS.1	18	16
BS.3	18	24
PILD.65	26	19
TK.12	29	21
BP.21	23	21
SAB.24	25	22
DK.19935	26	15
BP.8	27	15
DK.5315	19	13
DK.1	16	15
KIR.11	24	17
HEN.2	24	13
MK.1/1	10	4
MK.1/3	5	3
MK.3/2	31	19

It was decided that the clone museum would be uprooted and the field re-planted as an experiment in crown budding.

Uprooting and replanting were completed in the course of 1952. The clones used in this experiment are BD.5, AV.255, RRIM.501, LCB.1320, NAB.12, NAB.15, NAB.20, PR.107, PB.86, which all occur in 6 replications.

Besides two plots were planted with budded stumps of LCB.870.

The yields obtained from the now 10 year old LCB.870 (25 trees) amounted to 18 grams of dry rubber per tree per tapping.

A consignment of clone LCB.870 was sent to the U.S.A. Department of Agriculture who kindly agreed to have the clone tested for resistance against South American Leaf Blight (Dothidella Ulei). The clone is now established in the quarantine nurseries in Florida and budwood will shortly be sent to Turrialba for the actual resistance test.

3. 11. Crown Building.

3.11.1. Twinned seedling experiment at Hedigalla.

In this experiment 258 pairs of twinned seedlings are crown budded, one of the twins with LCB.870 and the other with TJ.1.

The girth figures at 4 ft. taken in April are as follows :—

	*TJ.*1 *Scion*	*LCB*870 *Scion*
TJ. 1. ill seed	10.03″	10.75″
PB.86 ,,	8.59″	9.84″
GL.1 ,,	10.24″	10.62″
MK3/2 ,,	8.95″	10.13″
WG.6278	9.73″	8.57″
Unknown seed	9.99″	6.09″
Untwinned seed	9.69″	9.36″
Overall average	9.52″	9.57″

The differences shown above are not significant.

An experiment was carried out to investigate the desirability of removing eventual side branches below the bud before budding.

The experiment result indicates :—

(1) The retention of branches below the budpatch does not interfere with the sprouting of the bud unless there is a whorl of 4 or 5 branches just below. In such cases the number of branches should be reduced to two.

(2) Growth of the scion is not adversely affected by the presence of side branches below the place of budding for the first 6 months. If kept longer the growth is slightly inhibited.

(3) Wind damage was much less in the plants where the lower branches were retained.

3.11.2 Experiment on Kepitigalla.

LCB.870 was crown budded on three plots of two hundred trees each in 1951. The stocks are TJ.1, PB.86 and clonal seedlings. Growth of the trees in these plots is very satisfactory.

3. 12. Artificial Defoliation.

Last year's experiment in defoliation was repeated in the same area and a quite satisfactory degree of defoliation was obtained in this field.

In addition to this, several other fields were treated with aerocyanamide, however with disappointing results.

The impression is gained that satisfactory defoliation with 'aerocyanamide' can only be obtained if the field is just about ready to winter naturally. Trees in which the leaves are not yet near the end of their natural life–span do not seem to be affected unless a large quantity of the chemical is deposited on the leaf under the right atmospheric conditions.

Further experiments will have to be undertaken before the method can be generally applied.

Small scale experiments were carried out with Sodium Cyanamide solution. This chemical proved to be more effective than the calcium cyanamide powder, but as it has to be applied in liquid form it cannot yet be considered for estate use because of application difficulties.

Refoliation after artificial defoliation. — It was observed that trees in which only the lower part of the crown was defoliated do not sprout from these defoliated lower branches until the top branches have wintered. This result was to be expected.

If complete defoliation is achieved, refoliation begins between 4 and 6 weeks after leaf fall.

4. Fomes lignosus.

This is next to Oidium the most important disease in Ceylon rubber, doing serious damage in replanted areas. Observations in the field confirm, that Fomes cases in a replanted area are due to infection by diseased roots of trees in the old stand.

In this connection it is important to point out that Fomes on the roots of a tree is not killed if the host is poisoned by Sodium Arsenite. Stumps of poisoned trees bearing fructifications of Fomes lignosus may be found in most clearings where poisoning of the old stand was practised.

Uprooting of the old stand and careful inspection of the root system of every tree, followed by appropriate measures wherever Fomes if found, is the best way to reduce incidence of root disease. Inspection of the root system of the uprooted trees is a necessity as it is often found that trees which did not show any signs of the disease above ground, already carried the parasite on the root.

5. Fomes noxius.—Only a few cases were reported.

6. Ustulina zonata.—No samples of Ustulina were received although the disease was occasionally observed in the field.

7. Corticium salmonicolor.—No samples received from outside sources.

8. Sphaerostilbe repens.—This disease was found on several occasions on badly drained land.

9. Phytophthora Bark Rot.—Samples of this disease were collected in an area subject to flooding and from a clearing where the cover crops had been allowed to grow right up to the trees.

10. Brown Bast.—According to writer's observations B.B. is prevalent in many young budded rubber plantings having suffered from Oidium.

It is the author's opinion that the considerable depression in yield which is experienced in many TJ.1 clearings in 1951 and 1952 is at least partly due to Brown Bast consequent upon Oidium attacks. It should be remembered that the Brown Bast condition can become incurable if the case is not given immediate attention. Fields showing a marked decline in yield should be examined for Brown Bast and if necessary the tapping intensity should be reduced.

11. Birds-Eye Spot.

Helminthosporium heveae was present in all R.R.I. nurseries causing considerable distortion of the leaves.

Dusting with copper (Cuprosana), spraying with Cuprous oxide(Perenox) and spraying with lime-sulphur were all found to give protection for a short time.

12. Borers.—One case of attack of young rubber by borers (Xyleborus sp.) was reported.

This occurred in a 3 year old planting of PB86. All trees in the clearing showed a flush and flowers and in no way were the three infested trees distinguishable from the others at the time the attack was first noticed. Three days later however the bark was showing discolouration and the tree yielded no latex when wounded. In order to save the trees it was advised that they be collar-pruned immediately.

Lightning is the only explanation for such a localized infestation with borers in otherwise perfectly healthy trees.

Research Laboratories,
Dartonfield,
Agalawatta.
13th February, 1953.

REPORT OF THE ESTATE SUPERINTENDENT FOR 1952

By

G. W. D. Barnet

Visiting Agent.—The Visiting Agent, Mr. J. D. Farquharson, visited the Institute's properties on 13th February and 14th November. Reports on his two visits were submitted to the Rubber Research Board.

Superintendent.—The writer was on duty throughout the year.

Dartonfield Group.

Dartonfield Division.

	A.	R.	P.
Mature Rubber Seedling Areas ..	34	0	19
Mature Rubber Replanted Areas ..	54	0	23
Immature Rubber Replanted Areas ..	61	2	30
Nurseries ..	3	0	21
Buildings and Roads ..	22	2	34
Forest, Scrub, etc. ..	2	2	19
*Total ..	178	1	26

*Revised acreages after fresh survey

Nivitigalakele Division

	A.	R.	P.
Mature Budded Rubber Areas ..	106	3	18
Immature Budded Rubber Areas ..	28	0	31
Nurseries ..	15	3	25
Buildings and Roads ..	2	0	15
Forest, Scrub etc. ..	20	2	23
Paddy Field ..	0	2	00
TOTAL ..	174	0	32

Hedigalla Division

	A.	R.	P.
Mature Budded and Seedling Rubber Areas	22	0	06
Immature Budded and Seedling Rubber Areas	217	3	06
Nurseries ..	2	0	00
Buildings and Roads ..	7	3	34
Forest, Stream Reservations, etc. ..	735	2	34
TOTAL ..	985	2	00
GRAND TOTAL ..	1338	0	18

Elevation — Factory at Dartonfield 215 feet.

Rainfall

Rainfall figures for 1948–1952 are shown below :—

	1948 *ins.*	1949 *ins.*	1950 *ins.*	1951 *ins.*	1952 *ins.*	5 *Years average* 1948–1952 *ins.*
January	7.21	6.48	2.05	13.21	5.03	6.79
February	5.65	0.38	5.77	2.12	8.40	4.46
March	11.52	5.87	9.51	11.61	6.63	9.03
April	13.55	19.58	11.40	14.60	11.69	14.16
May	17.97	18.73	16.38	23.40	18.00	18.89
June	24.12	16.29	9.48	23.20	13.69	17.35
July	6.00	12.37	9.31	23.54	2.50	10.74
August	9.19	23.81	8.36	1.76	6.92	10.01
September	14.94	10.97	11.30	18.57	8.70	12.89
October	22.25	24.73	26.88	11.98	19.08	20.98
November	19.71	13.38	7.14	17.80	12.30	14.06
December	10.22	6.44	2.54	5.03	16.01	8.05
	162.33	159.03	120.12	166.82	128.95	147.45

There were 190 wet days in 1952 as compared with 231 wet days in 1951. Rainfall was less than last year but more evenly distributed throughout the year.

Crop.

Yield Records of Individual Fields

Dartonfield

	Acreage	Total Yield lb.	Yield per acre lb.
Old Seedling Rubber Area	25½	11147	486.0
1934 Replanted Area	7½	5609	747.09
1936 „ „	9½	6013	632.9
1938 „ „	19½	12307	631.1
1939 „ „	2	1236	618.0
1941 „ „	6½	3921	603.2
1947 „ „	11	2110	191.8
Total acreage in tapping	81½	42343	519.5

Nivitigalakele

1926 Clearing	13	8351	642.3
1927 „	10	6709	669.9
1928 „	15¾	11245	713.3
1935 „	28½	23324	818.4
1939 „	10¼	8971	875.1
1940 „	9¾	7416	760.6
1940 Swamp Area	3¼	1901	585.0
1941 Clearing	7	7091	1013.0
1942 „	5	3922	782.4
1943 „	4½	2129	473.1
1944 „	3	343	114.3
Total acreage in tapping	110	81402	740.0

Hedigalla

1943 Clearing	11	6551	595.5
1944 „	14	5511	393.6
1945 „ (Part)	10½	638	58.1
1946 „	8	563	70.4
Total acreage in tapping	43½	13263	304.2
GRAND TOTAL	235	137008	582.9

	1952	1951
Estimated Crop ..	133,090 lb.	141,190 lb.
Harvested „ ..	137,008 „	162,570 „
Excess ..	3,918 „	21,380 „

Tapping

Tapping was stopped on 10th February to rest the trees during refoliation and recommenced on 3rd March. During the " resting " period new tapping cuts were marked in the Budded Rubber Areas where changes of panels were necessary. The trees in the Mature Rubber Seedling Areas were slaughter-tapped prior to felling and clearing for replanting. In the Replanted and New planted areas the following additional number of trees were brought into tapping :—

In Dartonfield

1947 Clearing Field No. 11 – 748 trees (First year of tapping).

In Nivitigalakele

1928 Clearing	—	1 tree
1935 ,,	—	1 ,,
1939 ,,	—	4 trees
1940 ,,	—	5 ,,
1941 ,,	—	3 ,,
1942 ,,	—	1 tree
1944 ,,	—	18 trees
TOTAL		33 Additional trees

Also 1943 Clearing – 245 trees (brought into tapping in September).

In Hedigalla

1943 Clearing	—	9 trees
1944 ,,	—	48 ,,
TOTAL		57 Additional trees

Analysis of tapping rounds for 1952 (1951 figures in bracket).

	Early tapping	*Late tapping*	*Resting*	*Rain*	*No tapping Holidays*
1st Quarter	62 (48)	5 (9)	20 (24)	2 (1)	2 (2)
2nd ,,	37 (47)	28 (27)	– (–)	24 (23)	2 (2)
3rd ,,	67 (64)	12 (18)	– (–)	12 (5)	– (–)
4th ,,	67 (72)	13 (16)	– (–)	10 (4)	3 (3)

Manufacture

The following kinds and grades of rubber were manufactured during the year :—

	Total in lb.	*Percentage of Grade*
Latex Crepe No. LX & No. 1	46094	33.63
,, ,, No. 2	20386	14.88
,, ,, No. 3	15410	11.25
Creamed Ammoniated Latex	22542	16.45
Normal Ammoniated Latex	1924	1.38
Latex Sole Crepe	5406	3.94
Latex for Experiments	319	.23
Scrap Crepe No. 1	12644	9.23
,, ,, No. 2	9222	6.73
,, ,, No. 3	1781	1.30
Scrap Sole Crepe	1280	.98
	137008	100.00

Roads, Paths, Steps etc.—All roads, paths, steps and bridges were maintained in good condition throughout the year.

Weeding.—All the mature rubber areas in tapping were weeded every other month during the year and are clean and tidy.

Fences and Boundaries.—Fences were repaired where and when necessary. In Hedigalla rough paths have been cut along all the boundaries for the use of the field watcher.

Manuring.—All mature budded and clonal seedlings rubber areas were manured with R–400 manure mixture broadcast at the rate of 2 lb. per tree.

Pests and Diseases.

Oidium Heveae.—The incidence of Oidium was very severe. No sulphur dusting operations were possible by the Estate Department on account of the non–availability of sulphur this year.

Fomes lignosus.—There were a few cases of this root disease in the mature rubber areas which were treated in the recommended manner.

Fomes noxius.—A few cases were dealt with in Hedigalla Division.

Ustulina Zonata.—This disease caused the deaths of a few trees.

Phytopthora palmivora.—The incidence of this was mild and did not give cause for anxiety.

Brown Bast.—All cases were treated and those trees beyond redemption were uprooted and stacked " in situ."

Other diseases etc.—Some trees were blown down during the South–West monsoon gales.

Canker Scraping.—Canker scraping was done where necessary and 10% Brunolinum Plantarium mixed with red powder was applied to the treated areas.

Bark Rot.—Applications of oily and water-soluble bark-rot mixtures were made to the tapped panels of the trees in dry and wet weather respectively as a preventive against this fungus.

Details of Mature rubber trees lost during the year.

Division	*Clearing*	*No. of trees*	*Cause of death*
Dartonfield	1934	8	Brown bast
	1936	7	Brown bast
	1936	7	Wind damage
	1936	3	Fomes lignosus
	1938	4	Wind damage
	1938	20	Brown bast
	1939	1	Ustulina zonata
	1941	9	Brown bast
	1941	1	Ustulina zonata
	1942	2	Fomes lignosus
Nivitigalakele	1926	4	Wind damage
	1926	1	Fomes lignosus
	1926	2	Ustulina zonata
	1927	5	Wind damage

Nivitigalakele	1927	2	Ustulina zonata
	1928	5	Wind damage
	1928	1	Fomes lignosus
	1935	10	Ustulina zonata
	1935	13	Wind damage
	1939	1	Ustulina zonata
	1939	2	Wind damage
	1940	2	Wind damage
	1940	3	Ustulina zonata
	1941	1	Wind damage
	1942	2	Wind damage
	1942	2	Ustulina zonata
	1944	2	Wind damage
Hedigalla	1944	1	Fomes lignosus

Agricultural Development. 1947 Clearing–11 acres–Dartonfield.

Weeding.—This clearing was weeded once a month during the year and is clean and tidy.

Pests & Diseases.—11 cases of Fomes lignosus were dealt with during the year. Some trees were damaged by a tree in the Stream Reservation nearby being felled illicitly. This was reported to the proper authorities but no action has been taken to date. The felled tree is still lying in this field.

Manuring.—R–215 manure mixture was forked in at the rate of 2 lb. per tree in two applications of 1 lb. each.

1950/51 Clearing – 30 acres – Dartonfield.

Weeding.—Regular monthly rounds of weeding and controlling leguminous cover crops were done during the year. The clearing is clean and tidy.

Manuring.—R–215 manure mixture was forked in lightly round each plant in two applications at the rate of ½ lb. per plant per application.

Pests & Diseases.—Fomes lignosus root disease continued to be the main cause of deaths in this clearing. 201 cases were dealt with during the year.

1952 Clearing – 35 acres – Dartonfield.

Felling & Clearing.—35 acres were felled and cleared. This work commenced towards the end of last year and was completed early this year with the aid of a mechanical winch grubber.

Lining.—This was done prior to cutting holes. Pegs were put out at a distance of 9′ × 30′ roughly on the contour in accordance with the requirements of the Botanical Department which is conducting a clone trial in this area. In an area about 3¾ acres, pegs were put out 5′ × 30′ for the Mycological Department.

Cutting holes.—Holes were cut 1½′ × 1½′ × 1½′ with an "alavango" hole 1′ deep in the centre of each hole.

Filling holes.—The holes which were cut were filled with top soil mixed with sifted excavated soil.

Grass & Shrubs.—All grass and shrubs were weeded out.

Weeding.—Regular monthly rounds of weeding and controlling the leguminous cover crops were done after the areas were planted.

Cover Crops.—Rooted cuttings of Desmodium ovalifolium were planted in the bare patches.

Planting.—In the Botanical Department area clones NAB.12, NAB.15, and NAB.20 were planted with clones PB.86 and R.R.I.M.501 as "controls." Clone NAB.17 was planted in an area outside this experiment. In the Mycological Department area clonal seedlings derived from the seeds obtained by cross-pollination by hand of clone LCB.870 with clones PB.86, GL.1, PR.107, LCB.870, LAV.18, NAB.8, R.R.I.501, R.R.I.506, NAB.19, R.R.I.514, NAB.5, PR.17, R.R.I.500, NAB.6 and R.R.I.513. were planted.

Manuring.—At the time of planting all the plants were manured with Animal Meal at the rate of 8 ozs. per plant. Two applications of R-215 manure mixture followed this initial application of manure.

Cleaning out drains and Silt pits.—This was done wherever necessary.

Paths & Steps.—Paths and Steps in this clearing were attended to and maintained in good order.

Pests & Diseases.—All known patches of Fomes lignosus infection were attended to most carefully. 65 cases were attended to this year.

Care & Attention.—After planting regular rounds of inspection were done and all "extra" shoots were cut off. Deaths for various causes were reported.

Terracing.—Terraces were built in rocky areas where drains could not be cut.

Supplying Vacancies.—In the Botanical Department area all dead budded stumps were replaced with plants of the appropriate clone.

Boundaries.—The fences were repaired where necessary.

1943 Clearing – 7 acres – Nivitigalakele.

Drains & Silt Pits.—Drains and Silt pits were cut where necessary in the steep slopes of this field.

Weeding.—Regular monthly weeding rounds were done throughout the year. The clearing is clean and tidy.

Cover Crops.—Desmodium ovalifolium rooted cuttings were planted in all the bare patches of ground.

Pests & Diseases.—No diseases resulting in death of plants occurred in this clearing this year.

1946 Clearing – 21 acres – Nivitigalakele.

Weeding.—This clearing was weeded every month this year and is clean and tidy.

Cover Crops.—All bare patches of ground were planted with rooted cuttings of Desmodium ovalifolium.

Manuring.—All the trees in this clearing were manured with R–215 manure mixture at the rate of 2 lb. per tree in two applications of 1 lb. per tree per application.

Paths & Steps.—Paths and Steps were attended to when necessary.

Pests & Diseases.—4 trees were lost as a result of Ustulina zonata attacking their roots and one was blown down by wind this year.

1945 Clearing – 25 acres – Hedigalla.

Weeding.—This clearing was weeded regularly every month during the year and is clean and tidy.

Manuring.—R–215 manure mixture was applied to the trees in this clearing at the rate of 2 lb. per tree in two applications of 1 lb. per tree per application.

Pests & Diseases.—8 trees were lost on account of Fomes lignosus root disease, 5 owing to Fomes noxius (brown root) disease and 3 as a result of wind damage.

1946 Clearing – 16 acres – Hedigalla.

Weeding.—This clearing was weeded every month during the year and is clean and tidy.

Manuring.—All the trees in this clearing were manured with R–215 manure mixture. Two applications were given at the rate of 1 lb. per tree per application.

Pests & Diseases.—Only 1 tree died in this clearing. This was due to Fomes noxius infection of its roots.

1947 Clearing – 60 acres – Hedigalla.

Supplying Vacancies.—In the 500–point area in this clearing vacancies were planted with stumped buddings of clone LCB.870.

Weeding.—This clearing was weeded every month during the year and is clean and tidy.

Manuring.—All the trees in this clearing were manured with R–215 manure mixture which was applied at the rate of 12 ozs. per tree per application.

Pests & Diseases.—14 trees in this clearing succumbed to Fomes lignosus infection of their roots. The recommended treatment was given in all these cases, and the ones which occurred in all the other clearings.

1949 Clearing – 30 acres – Hedigalla.

Weeding.—This clearing was weeded every month throughout the year and is clean and tidy.

Manuring.—The trees in this clearing were manured with R215– mixture at the rate of 1½ lb. per tree in two applications of 12 ozs. each.

Pests & Diseases.—Fomes noxius killed 2 trees and Fomes lignosus caused the death of 12 trees in this clearing. Lightning killed 1 tree.

1950 Clearing – 20 acres – Hedigalla.

Care & Attention.—All " extra " shoots were cut off in the plants in this clearing and all detected diseases were reported for necessary treatment.

Supplying Vacancies.—All vacant planting points were planted with budded stumps or stumped buddings of the appropriate clone.

Weeding.—Regular monthly weeding rounds were done throughout the year. The clearing is clean and tidy. Cover crops were controlled, too.

Manuring.—R–215 manure mixture was applied at the rate of 1 lb. per plant in two applications of ½ lb. per plant per application.

Paths & Steps.—These were attended to where necessary.

Pests & Diseases.—11 trees in this clearing died as a result of Fomes lignosus root disease. The infected areas were attended to.

1952 Clearing – 75 acres – Hedigalla.

Felling, Clearing and Burning.—Besides the 75 acres set aside for planting this year a further 8 acres were felled and cleared.

Lining.—Portion of the cleared areas were " lined and pegged " according to the requirements of the Agronomy and Botany Departments. The rest of the areas were " lined and pegged " in the usual manner.

Cutting Holes.—Holes were cut to the recommended size.

Filling Holes.—This was done with top soil.

Grass & Shrubs.—Grass and shrubs were all weeded out.

Cover Crops.—Desmodium ovalifolium rooted cuttings were planted in previously cleared areas during wet weather.

Weeding.—Regular monthly weeding rounds were done after the areas were planted.

Planting.—Out of the whole clearing (83 acres) portions were planted with budded stumps of selected clones and seedlings derived from clonal seeds in accordance with the requierments of the Agronomy and Botany Departments. The areas not utilized by these Departments were planted by the Estate Department with recommended planting material.

Manuring.—At the time of planting all plants were given an initial dose of 8 ozs. of Animal Meal manure. Thereafter the Agronomy Department experiments were manured according to the requirements of that Department and the other areas were given 2 subsequent applications of R–215 manure mixture at the rate of 4 ozs. per plant per application.

Paths & Steps.—Paths and Steps to aid " inspection " and " supervision " were made.

Planting Coffee in 1949 Clearing – Hedigalla.

Temporary Shade.—Cuttings of Gliricidia maculata were planted along the rows of coffee plants.

Weeding.—Cover Crops were pulled back monthly from round each plant.

Manuring.—The plants were manured with R–215 manure mixture at the rate of 1 lb. per plant given in 2 applications of ½ lb. per plant per application.

NURSERIES (REVENUE ACCOUNT)

Seedling Nurseries – 1 acre – Dartonfield.

Weeding.—Weeding was done monthly and these nurseries are clean and tidy.

Planting.—Seedlings obtained from clonal seeds from Moneragalla Estate, Moneragala, were planted in beds prepared for the purpose.

Manuring.—The above seedlings were first manured with Animal Meal manure. Subsequent manuring was done with R–215 manure mixture.

Pests & Diseases.—Areas infected with Fomes lignosus disease were thoroughly grubbed and cleaned.

Fencing.—½" wire netting was put round these nurseries.

Seedling Nurseries – 6 acres – Nivitigalakele.

Preparing Beds.—Beds were prepared for planting clonal seedlings.

Fencing.—" Milla " posts and barbed wire fences were put round areas not previously protected.

Planting.—Seedlings were planted for use as stocks in 1954.

Weeding.—Regular monthly weeding rounds were done and these nurseries are clean.

Pests & Diseases.—Areas infected with Fomes lignosus root disease were specially treated.

Budding & Attention.—The 1952 planting requirements of budded stumps were budgrafted under the personal supervision of the Experimental Conductor at Nivitigalakele.

Uprooting for Transplanting.—The requirements of the various clearings at Dartonfield and Hedigalla were carefully uprooted and despatched to the respective Divisions.

Thinning out Backward Plants.—After 6 months of growth all "runts" were weeded out.

Seedling Nurseries – 5 acres – Hedigalla.

Weeding.—These nurseries were weeded regularly and are clean.

Manuring.—Manuring was done regularly — dosage and variety of manure being according to the age of the seedlings.

Planting.—Seedlings obtained from germinated clonal seeds purchased from Durampitiya Estate were planted in prepared beds.

Budwood Nursery – ¼ acre – Dartonfield.

Weeding.—Weeding was done regularly.

Manuring.—This nursery was manured at the same time and at the same rate as the 1950 Clearing — Dartonfield.

Pollarding.—Budwood was cut and supplied to various estates and Small Holders on orders received through the Botanist.

Budwood Nurseries – 7 acres – Nivitigalakele.

Weeding.—Regular monthly weeding rounds were done and these nurseries are clean.

Manuring.—The plants in these nurseries were manured regularly.

Pollarding.—Budwood was supplied to various estates and Small Holders on orders received through the Botanist.

Food Crops.—The paddy field at Nivitigalakele was cultivated and paddy harvested.

Pineapples obtained from plants growing in the Immature clearings at Hedigalla were sold to members of the Staff of the Institute and to estate labourers.

FIELD EXPERIMENTS

Dartonfield.

Labels.—Tree numbers were stamped on labels for various experimental purposes.

Test Tapping.—Test tapping was done regularly for the Agronomy, Botany and Mycology Departments.

Miscellaneous Experiments.

Rain Guard.—The rain-guard experiment was continued this year for the Botany Department.

Manuring.—The manuring experiment was done this year, too, according to the requirements of the Agronomy Department.

Oidium Research & Mycology.—Various experiments were conducted by the Mycologist relating to Oidium Research and diseases of rubber trees.

Nivitigalakele.

Labels.—Tree numbers were re-stencilled on trees in the various clearings.

Test Tapping.—Test tapping was done for the Botany Department in some of the clearings.

Oidium Research.—Paths were cut in the 1926, 1927, 1928 and 1935 clearings for the use of the Jeep and a little Tractor which are utilized for transporting various dusting and spraying machines used by the Mycology Department.

Hedigalla.

Labels.—Labels were made and affixed to various trees in the clearings for identification purposes.

Test Tapping.—Test tapping was done for the Botany Department on selected trees in the 1943 and 1944 clearings.

Miscellaneous Experiments.—A Crown-budding experiment is being conducted for the Mycology Department in the 1949 clearing.

The areas planted for the Agronomy Department were manured according to the requirements of that Department.

1953 SUSPENSE ACCOUNT

1953 Clearing – 14 acres – Dartonfield.

Felling & Clearing.—The old seedling rubber trees in approximately 9 acres were mechanically felled and cleared this year.

Pests & Diseases.—10 areas known to be infected with Fomes lignosus disease were attended to in the recommended manner.

1953 Clearing – 7 acres – Nivitigalakele.

Felling, Clearing and Burning.—The jungle trees in the whole area have been felled and burnt lightly. The arranging of timber roughly on the contour is in progress.

Lining.—Pegs were put out to mark the planting points at 35′ × 5′.

Boundaries.—All the Milla posts available from this area were used as fence posts.

1953 Clearing – 111 acres – Hedigalla.

Felling, Clearing and Burning.—All the areas to be planted in 1953 have been cleared.

BUILDINGS ETC. (REVENUE ACCOUNT)

Maintenance of Buildings etc.

General Buildings.—Necessary repairs were effected where required to the Offices and Laboratories.

Bungalows.—Bungalows were properly maintained during the year.

Water & Power Supply.—Water and Power supply lines were attended to throughout the year.

Bungalow Furniture.—Unserviceable rejected articles of furniture were replaced during the year.

Motor Vehicles.—The Station Waggon, Jeep and Lorry were properly maintained throughout the year.

Machinery.—The consulting Engineers, Messrs. H. W. Hammond & Co., inspected the machinery and electrical fittings and equipment in February this year and submitted their report to the Board.

Power Plant.—(*a*) 80/90 B.H.P. National Engine worked satisfactorily during the year.

(*b*) 55 K.W. 230 Volts D.C. Generator driven by the above engine worked satisfactorily.

(*c*) 52 B.H.P. Vertical Ruston Engine was completely overhauled by an Engineering Firm. The Board has sanctioned the sale of this engine to make room for a 160 K.W. lighting plant on order.

(*d*) 32 K.W. 230 Volts D.C. Generator direct-coupled to the above engine is in good order and is to be sold together with this engine.

(*e*) 20 B.H.P. Gardner Oil Engine (Cold Start) is in good order.

(*f*) 12 K.W. 230 Volts D.C. Generator is in good order. This Generator together with the above engine will be sent to Hedigalla and a 24 K.W. lighting plant is on order to take its place.

(*g*) Air compressor driven by a 2 H.P. Motor is in good order and worked satisfactorily.

(*h*) 5 B.H.P. National Engine at Nivitigalakele required some attention during the year. This engine drives a 2½ K.W. Generator.

The 2 Starting Air Bottles.—The 2 Starting Air Bottles in the Engine Room were tested in accordance with the new Factory Ordinance.

The Streamline Oil Filter.—The Streamline Oil Filter in the same room worked satisfactorily throughout the year.

Machinery in Factory.

1–26″ Water-cooled Grooved Mill by Brown & Co. Ltd. driven by a 25 H.P. Electric Motor. The mill and motor worked satisfactorily.

1–26″ Water-cooled Smooth Mill by Brown & Co. Ltd. driven by a 25 H.P. Electric motor are both in good order.

1–24″ Smooth Sheeting Mill driven by a 1½ H.P. Electric Motor. Both in good order.

1–24″ Spiral Sheeting Mill driven by a 1½ H.P. Electric Motor. Both in good order.

2–12″ Experimental Mills (1 Smooth & 1 Grooved) driven by a 5 H.P. Electric Motor. Completely overhauled this year and in good order.

Machinery in Chemical Department Section of Factory.

1–6 N.H.P. Vertical Cross Tube Boiler in good order. This boiler has been examined and tested by the Visiting Engineer and a certificate of fitness has been issued by him.

1–30″ Hydro–Extractor driven by a 4 H.P. Electric Motor are both in good order.

1–High Speed Disintegrator driven by a 3 H.P. Electric Motor. The motor has been sent to an Engineering Firm for necessary repairs.

1–Centrifugal Separator by De Laval, driven by a ½ H.P. Electric Motor are both in good order.

1–Air Compressor by William Allday & Sons. In order.

1 Latex Evaporator. In order.

1–Baling Press. In order.

1–Water Filter. In order.

1–Ball Mill driven by a 1 H.P. Electric Motor. In order.

1–Colloid Mill driven by a ½ H.P. Electric Motor. In order.

1–Vacuum Drier and Steam Pump. In order.

1–Steam Vulcanising Press (hand worked). In order.

1–Small Mill by David Bridge fitted with a 7½ H.P. Electric Motor. This is a new machine and is in good order.

1–Hydraulic Vulcanising Machine.—This is another new machine which is in good working order.

Water Pumps.—The four electrically driven water pumps are in good order and worked satisfactorily.

Bungalow Lighting Installations were found to be in good order by the Visiting Engineer.

Fuel Consumption of Power Plants.—Details of fuel consumption in 1952 are given below :—

80/90 *B.H.P. National Engine*		*Average per hour*
Liquid Fuel	..	1.75 gallons
Lubricating Oil	..	0.19 „

Ruston Engine

Diesolene Lubricating Oil	}	Only tested after overhauling

Gardner Engine – 20 B.H.P.

Liquid Fuel	..	0.75 gallons
Lubricating Oil	..	.06 „

BUILDINGS (CAPITAL EXPENDITURE)

Intermediate Bungalow.—This bungalow has been built on Dartonfield and the necessary electrical fittings and water service and indoor sanitation put in.

Junior Staff Bungalows.—The work on the two new bungalows was completed this year.

Double Cottages for labourers.—4 Double Cottages (Type Plan A) and 8 Double Cottages (Type Plan A) were completed on Dartonfield and Hedigalla respectively. Another 6 Double-room Double Cottages (Type Plan 91) were built on Hedigalla.

New Lorry Garage.—This building was completed this year.

Drying Chambers.—2 small drying chambers were built on Hedigalla for drying test tapping biscuits.

Indoor Sanitation for J.S. Bungalows.—Indoor sanitation at Dartonfield, Nivitigalakele and Hedigalla was provided.

6 Water-Seal Latrines.—6 water seal latrines were built to replace old pit type latrines.

School and School-master's Quarters.—This building is nearing completion at Hedigalla.

Co-operative Store, Bakery, Creche and Rice Store.—This building has been completed.

Converting Engine Driver's Quarters into Workshop.—This work is nearing completion.

Alteration to Estate Office.—This work has been completed.

Renovating Dartonfield and Nivitigalakele Condutcor's Bungalows.—These works are nearing completion.

Putting in Extra Doors to J.S. Bungalows.—This work is in progress.

Converting Store rooms into Dining rooms in J.S. Bungalows.—This work is in progress and will be completed early in 1953.

Extensions and Improvements to Estate Superintendent's Bungalow.—This work has been completed.

Alterations to Drying Chamber – Dartonfield.— This work has been completed by Messrs. Brown & Co., Ltd.

Tunnel Type Smoke House.—A new one is to be built by the above Engineers.

Factory Extension.—This work is in progress and should be completed early in 1953 by the same firm.

Store for Sulphur.—This building is nearing completion.

Transferring Batteries to Old Workshop.—The necessary alterations to the building are being done to enable the batteries to be transferred to the old workshop.

Water and Power Supply – Electric lights for Nivitigalakele Bungalows.—This work of putting in the electrical wiring and fittings is in progress and should be completed early in 1953.

1 Electric Lighting Set (160 K.W.) and 1 Electric Lighting Set (24 K.W.) are on order.

Underground Cable to Senior Staff Bungalows.—The cable has been laid and is functioning.

Altering route of power line to J.S. Bungalows.—This work has been postponed and will be done in 1953.

Augmenting Factory Water Supply.—This work is in progress and nearing completion.

Machinery.

1 Scrap Washer with electric motor	—	on order
1 Smooth Mill with electric motor	—	on order
1 Experimental Smooth Mill with electric motor	—	on order
1 Washing Mill with electric motor	—	on order

Labour.—Wages were paid throughout the year in accordance with the Ordinance in force.

Dartonfield Group.

Ceylonese	*Resident*	*Non-Resident*	*Total*
Men	56	201	257
Women	44	124	168
Children	19	48	67
Non-Ceylonese			
Men	36	—	36
Women	35	—	35
Children	8	—	8
TOTAL	198	373	571

Annual Holidays.—Annual holidays with pay were given to all labourers entitled to them according to the Ordinance.

Maternity Benefits.—Three ordinary and six alternative payments were made according to the Ordinance.

Feeding Children.—Free rations and ¼ lb. of bread per diem were issued to all non-working children of labourers.

Health.—The health of the members of the staff of the Institute and estate labourers has been satisfactory during the year 1952.

Infectious and Contagious Diseases.—1 case of Measles and 3 cases of Dysentery occurred during the year. The patients were isolated and treated.

Tuberculosis.—A few suspected cases of this disease were reported to the M.O.H. at Agalawatta, but no action has been taken to date.

Births.—12 children were born during the year on Dartonfield Group.

Deaths.—One labourer died on Dartonfield as a result of Pulmonary Tuberculosis. This labourer returned from hospital without being cured.

Hookworm.—Mass treatment of labourers at Dartonfield and Hedigalla was carried out by the Medical Officer of Health, Agalawatta. 182 labourers were treated by him. The Dispenser has successfully treated 45 labourers on Nivitigalakele. Secondary treatment was given by him to 57 labourers too.

The following is a list of the diseases treated during the year by the Dispenser :—

Influenza	..	226 cases
Malaria	..	37 ,,
Ulcers	..	108 ,,
Worms	..	54 ,,
Anchylostomiasis	..	17 ,,
Other diseases	..	666 ,,
	TOTAL	1108 cases

Correspondence.

Inward	..	478
Outward	..	1071

Dartonfield Group,
Agalawatta.
13th February, 1953.

REPORT OF THE SMALLHOLDINGS PROPAGANDA OFFICER FOR 1952

By W. I. Pieris

The work of the Smallholdings Department, both in the field and in office, increased during the year with the further issue of fairly large numbers of new planting permits and the opening of large nurseries for providing planting material to smallholders, in addition to its normal work. The market price of No. 1 smoked sheet further declined from about Rs. 1.72 per pound in January to about Rs. 1.09 in October, but improved during the last quarter of the year to the fixed figure of Rs. 1.35 with the ratification of the China agreement.

Staff.

The Smallholdings Propaganda Officer who completed his 22nd year of service with the Rubber Research Institute proceeded on 6 month's end of contract leave out of the Island on 1st April and resumed duties on 1st October. Mr. N. W. Palihawadana, Senior Assistant Propaganda Officer, was in charge of the Department's work during his absence.

Mr. P. W. W. de Silva, Research Probationer to the Botanist, was transferred to this Department as Probationary Assistant Propaganda Officer with effect from 15th September and was attached to the Assistant Propaganda Officer (South) Kalutara for the remainder of the year so that he may acquaint himself with smallholdings work.

The following officers left during the year :—

Mr. D. P. A. F. Abhayawardhana, Clerk-Translator, at end of January.

Mr. Chandra de Silva, Rubber Instructor, Matugama, at end of February.

The following new appointments were made with effect from 1st February:

Mr. M. D. M. Gunawardana, as	Rubber Instructor		Undugoda.
Mr. S. C. Rajasinghe,	,,	,,	Nivitigala.
Mr. R. Gunadasa,	,,	,,	Talgaswela.
Mr. W. M. D. Wijesundara	,,	,,	Migahatenna.

Mr. W. G. Mudianse who was appointed as a Rubber Instructor at the same time as the above officers was discontinued on 2nd March owing to ill-health.

All new Rubber Instructors were given a course of training before they were sent to their ranges. The training consisted of a short course of lectures by the writer followed by practical training at Nivitigalakele. The opportunity was taken simultaneously of giving a " refresher " course to Rubber Instructors already in the Department who did not appear to be sufficiently sure of their work. 16 officers attended this course.

Mr. A. B. Jayasundera who was appointed as Accounts Clerk as from 2nd January received two weeks' training at the Head Office at Dartonfield before taking charge of his duties.

Loans, ranging from Rs. 2,000/- to Rs. 2,825/- each, were given by the Board to four Rubber Instructors for the purchase of motor bicycles. The motor cycle mileage rate for Instructors was raised from 15 cents to 19 cents as from 1st February in keeping with similar increases for other grades of staff.

Latex Centres.

9 out of the 11 smallholders' co-operative latex centres organised by this Department in the Kalutara district in 1951 continued to supply latex to the Dunlop Latex Corporation at Katukurunda throughout the year, the two small centres at Wettewa and Bollessagama having closed down owing to their inability to collect an adequate supply of latex. These 9 centres supplied a total of 233,825 lbs. of dry rubber (average of 2,164 lbs. per centre per month) in the form of latex for the year and received payment at 2 cents per pound below the prevailing top market price of sheet, which resulted in a considerable gain to the members concerned as against the usual practice of individual sheet manufacture and sale to middlemen. Moreover members received extra payments periodically, which represented half the nett profits made by the Corporation on the sale of members' latex. These extra profit payments advanced to a guaranteed minimum of 3 cents per pound during the last quarter but soon after, owing to losses likely to be sustained by the Corporation as a result of Ceylon's rubber agreement with China, they asked to be allowed to withdraw from such minimum profits guarantee while continuing to pay the rate of 2 cents below market price for latex purchased. The future of the scheme, however, is somewhat uncertain in view of the position that has developed whereby the Corporation has to buy latex on the Ceylon market price of Rs. 1/35 per pound and sell it at the Singapore (world) price which is considerably lower.

495 visits were paid by Instructors to latex centres to supervise work. At the request of the Latex Corporation and in view of its uncertain future no further efforts were made to form new latex centres.

New Planting.

The acreage of middle and peasant-class new-planting permit-areas under the supervision of this Department was further increased by the issue of 3318 permits, comprising 5332 acres, by the Rubber Controller during the year. Similar issues for 1951 and 1950 were :—

	No. of Permits	*Acres*
1951	4213	6526
1950	2023	3478

Including the 18,654 N.R.P.S. holdings covered by the 1949–50 survey, a total of some 28,000 middle and peasant-class new-planting holdings, comprising some 63,000 acres, has therefore come under the purview of this Department since 1948, of which "class 3" holdings (*i.e.*, those of very poor growth and not likely to make satisfactory plantations) are not regularly visited. 18,787 visits were paid by the field staff to these areas in 1952. 4195 additional visits were made for reporting on the suitability of lands for the issue of new-permits. 102 permits covering 215 acres were cancelled for non-planting.

A record of each visit to these holdings, the defects observed thereat and recommendations made was kept by every Rubber Instructor. Reports indicate that 75% of class 1 and 2 N.R.P.S. holdings (*i.e.*, those of satisfactory growth and those whose growth is poor but are capable of improvement as revealed by the 1950 survey) are far better maintained under the supervision of Rubber Instructors than the average Rubber holding has been in the past, and about 80% of class 1 and 2 holdings and 30% or more of class 3 holdings can now be regarded to be in tapping either wholly or partly. Such factors as frequency of tapping and bark consumption are often beyond the control of Instructors in spite of frequent warnings, but general maintenance, soil conservation, quality of tapping etc., are generally favourable.

The complete absence of prosecution by the Rubber Controller against illicit Rubber plantations which are constantly brought to his notice by our staff is unfortunate in that it encourages negligent permit-holders to believe that they are under no obligation to follow Instructors' advice. In view of the great economic importance of correct tapping and maintenance of holdings, on which the Government has spent money in the form of soil conservation grants and free planting material, it is suggested that in future state-aided planting schemes due regard should be paid to the imposition of penalties not only against bad planting but also against improper maintenance and harmful tapping.

Assistance was given to the Department of Agriculture in lining and opening demonstration Rubber blocks at the Boys' and Girls' Farms, Kundasale, and at Karapincha near Ratnapura.

11,085 plants in 50 N.R.P.S. holdings were budded, of which 2044 plants were budded for peasants by budders paid by this Department at 8 cents per success.

Planting Material.

Applications were received from smallholders for 33,071 clonal seedlings, of which 21,316 were supplied as follows according to available supplies :—

Source	*Free Issues to Peasants*	*Sales*	*Total*
Walpita Farm	11777	950	12727
Horana Farm	1745	130	1875
Egaloya Farm	150	—	150
Nivitigalakele	4506	2058	6564
TOTAL	18178	3138	21316

1300 budded stumps were sold from range and Nivitigalakele nurseries. 1967 yards of budwood were sold or issued free to different classes of planters from the Eraminigolla, Egaloya and Nivitigalakele nurseries.

In accordance with the decision of the Board to provide as much planting material as possible to meet smallholders' demands, fairly extensive nurseries of clonal seedlings and ordinary seedlings (for issue as budded stumps) were established at Nivitigalakele and at Government Farm nurseries placed at our disposal. About 185,000 clonal seedlings were planted at 6 Government Farms and will be available for issue in 1953. To meet further demands 106,000 ordinary seedlings will be available in smallholders' nurseries at Nivitigalakele and in Government Farms, to be budded and issued as budded stumps in 1953 or later. These include 1951 plantings which had not developed sufficiently for budding during 1952. The year was a good one for seed production and much better germination of seed was obtained than in 1951.

The price of budded stumps to replanters and middle-class new-planters was raised from 35 cents to 50 cents per stump and that of clonal seedlings from 15 to 25 cents each. Clonal seedlings are issued free to peasant-class new-planters, but the terms on which budded stumps are to be issued to this class have yet to be determined by the Board.

The extent to which ½" diameter nursery seedlings could be successfully budded was tried on a small scale in the smallholders' nursery at Nivitigalakele and 50% successes were obtained. In view of the saving in time and money that such budding would make possible, further trials will be made in 1953.

The budwood pollarded in the Egaloya and Eraminigolla nurseries in October 1951 had not developed sufficiently for cutting, but it is hoped that it will be ready for budding smallholders' nurseries in 1953. The Rubber nurseries at the Walpita, Egaloya, Eraminigolla, Horana, Labuduwa and Karapincha Government Farms were supervised by the local Rubber Instructors. Instructors paid 495 supervisory and advisory visits to nurseries.

Replanting.

The slow and unsatisfactory progress made in replanting the large numbers of spent and slaughter-tapped smallholdings in Ceylon has to be stressed once again in view of their important economic significance to the Rubber industry. Better progress could only be obtained with Government assistance and the abandonment of the ' Replanting Subsidy Scheme ' contemplated by Government in 1951 was therefore unfortunate. News was, however, received during the latter part of 1952 that the new Minister for Agriculture was keen on re-establishing the scheme and financing the heavy expenditure that it would involve from the profits of the China Rubber Agreement, but no finality in the matter was reached.

Replanting permits issued in 1952 were :—

	Permits	*Acres*
Smallholdings	204	339
Estates over 10 acres	221	4723

These figures indicate that progress in general is unsatisfactory, and very much so in the case of smallholdings. By comparison 2121 acres of smallholdings of under 10 acres were replanted in Malaya in 1951.

The Urumiwela and Thunbage Replanted Rubber Colonies were supervised by the local Rubber Instructor at the request of the A.G.A. Kegalla.

1366 visits were paid by Instructors to replanted holdings. Replanting was completed on 42 holdings (80½ acres) under Instructors' supervision.

Sheet Improvement.

Attention was paid by the field staff to the improvement of smallholders' sheet by giving frequent sheet-making demonstrations, building standard-type smallholders' smokehouses, supplying guaranteed acid, mesh, pans etc. at concession rates and by the issue of "Quality Certificates" to those who made good sheets. 788 sheet-making demonstrations were given and 717 aluminium latex pans, 932 sq. ft. of mesh and 1790 bottles of acid were sold. 816 samples of acid were tested and 28 Quality Certificates issued. 57 demonstration and 69 private smokehouses were constructed and 125 existing houses were improved. 8095 visits were paid by Instructors to smallholders' smokehouses and 855 to Rubber Commissioner's Depots.

It is unfortunate that the useful service hitherto rendered to smallholders by this Department in supplying guaranteed D.C.I. acid in sealed bottles at the very low price of Rs. 1/- per bottle would no longer be possible owing to the discontinuance by Government of acid manufacture.

Soil Conservation.

Rs. 11,362/01 was paid to 233 peasant-class new-planters as soil conservation grants. 1712¾ acres in 1364 N.R.P.S. holdings, 161 acres in 101 replanted holdings and 60 acres in 28 mature holdings were lined by Instructors for contour drains or stone terraces against soil erosion.

Demonstrations.

Other than the demonstrations already mentioned under various headings 696 tapping, 54 budding, 161 disease control and 659 miscellaneous demonstrations were given by Instructors.

Correspondence.

General		
	Inward	2375
	Outward	1775
With Rubber Controller		
	Inward	3250
	Outward	4873

General.

A number of models made by officers of the Department were supplied to the Rubber Industry stall at the Colombo Plan Exhibition in February. The writer served on the Rubber Sub-Committee of the Exhibition and attended a number of conferences connected therewith. Groups of field officers were on duty at the Rubber stall in turn throughout the Exhibition.

The Rubber (sheet) Co-operative Society at Aruppola was opened by the writer on January 7th and 18 coagulating pans were presented as a gift.

An article on "The Work of the Smallholdings Department" was contributed for publication in the Rubber Research Institute Quarterly Circular and the "Tropical Agriculture."

Office of the Smallholdings Propaganda Officer,
Eastern Bank Building, P.O. Box 901, Colombo.
13th February, 1953.

AUDITOR GENERAL'S REPORT FOR 1951

No.
Audit Office,
Colombo 7, 25th September, 1952.

The Chairman,
Board of Management,
Rubber Research Institute, Agalawatta.

Sir,

The Accounts of the Rubber Research Institute, Agalawatta (Ceylon) for the year ended 31st December, 1951 were audited under my direction. The Financial Statements, *viz* :—

(*a*) Capital Account, Revenue Account and General Balance Sheet,
(*b*) Dartonfield Group Working Account, and
(*c*) Provident Fund Working Account.

were compared with the books and accounts and found to agree. The Balance Sheet has been duly certified and is returned herewith. The following are the comments which I consider it necessary to offer on these Accounts :—

I. Income

2. The actual income for the year amounted to Rs. 1,707,112.13 as compared with Rs. 1,881,724.39 for the previous year. The income for the year includes a sum of Rs. 211,394.52 on account of Cess collections in respect of December, 1950 which was outstanding at the end of 1950. The income exceeded the Estimates by Rs. 264,812.13. A comparative statement showing the estimated and actual income under the different accounts is annexed — marked " A ". The excess of actual income over the estimated income was about 18% and the causes for the variations are indicated in that statement. The Working Account of the Dartonfield Group showed a large profit for the year and this was mainly due to better crops and good prices realised.

3. Interest on investments for the year amounted to Rs. 67,099.13 as compared with Rs. 38,230.27 for the previous year. The increase in the amount of interest received was due to an additional Investment of Rs. 500,000.00 in Ceylon Government Loan Stocks during the year of Account.

II. Expenditure

4. **Revenue Expenditure.**—The total expenditure on revenue account exclusive of the amount provided for depreciation of Fixed Assets (Rs. 32,809.27) and audit fees (Rs. 1,500.00) amounted to Rs. 762,936.91 as compared with Rs. 602,974.48 for the previous year. The details of revenue expenditure are as set forth in the Revenue Account which was examined in audit with the connected vouchers and accounts in support thereof.

5. **Capital Expenditure.**—The net addition to Capital Expenditure during the year amounted to Rs. 246,198.77 as compared with Rs. 89,096.98 for the previous year.

6. **Estimated & Actual Expenditure.**—The statement marked ' B ' annexed hereto provides a comparison between the approved estimates of expenditure and actual expenditure. The reasons for the variations as furnished by the Director are shown against the respective items in the Statement.

Under Revenue Expenditure there has been excess expenditure on 10 items aggregating Rs. 22,132.09 and under Capital Expenditure there was a total excess expenditure of Rs. 11,511.49 on 9 items.

Covering sanction of the Board will have to be obtained for the excess expenditure under these 19 items.

7. **Provident Fund Reserve – Rs. 259,656.61.**—The balance to the credit of the Fund on 31-12-1950 was Rs. 207,073.22. Additions to the Fund during 1951 amounted to Rs. 84,840.17. Payments out of the Fund were as follows :—

To nine officers who left the Scheme	Rs.	32,244.88
Refund of over-recovery	,,	11.90
	Rs.	32,256.78

The amount to the credit of the Fund at the end of 1951 was Rs. 259,656.61.

8. **Advance Account – Rs. 19,292.49.**—This includes a sum of Rs. 6547.94 due from the London Advisory Committee representing balances of advances made to it to meet cost of supplies and services obtained by the Committee for the Rubber Research Institute.

9. **Payments in Advance – Rs. 20,041.55.**—This is made up as follows :—

Telephone rental 1952	..	Rs.	240.00
Payments to contractors	..	,,	192.00
Insurance (fire)	..	,,	5,388.26
Rent of Crown land (1952)	..	,,	5.50
Dartonfield – Advance work	..	,,	13,691.04
Subscriptions for Publications	..	,,	524.75
		Rs.	20,041.55

10. **Stocks – Rs. 8,379.49.**—This comprises the following :—

Rice & Foodstuffs	..	Rs.	1,132.38
Materials & Stores	..	,,	7,247.11
		Rs.	8,379.49

and represents stocks in hand at 31st December, 1951. These have been valued at cost price.

11. **Loans to officers – Rs. 38,845.11.**—This represents the amount outstanding on 31–12–1951 from employees to whom loans were granted for the purchase of transport.

12. **Outcome of the Accounts.**—The year's working has yielded a surplus of Rs. 908,365.95 as compared with a surplus of Rs. 1,245,619.49 for the previous year. When this is added to the accummulated surpluses brought forward from the previous year amounting to Rs. 1,797,523.93 together with a further sum of Rs. 10,640.62 being proceeds of sale and amount reserved as depreciation in respect of some Capital Assets disposed of in the year under review the total accummulated surpluses available for disposal amounted to Rs. 2,716,530.50. After appropriating Rs. 251,254.06 for Capital Expenditure and transferring Rs. 808,201.46 to the Reserve for Stabilisation of Income thus bringing it up to the round figure of Rs. 1,000,000.00 the balance carried forward to the next year was Rs. 1,657,074.98.

III. General

13. The Accounts were received quarterly and audited in this office. The office of the Institute at Dartonfield Estate, Agalawatte was visited by my officers in the last week of July 1952 in connection with the inspection of books and records and verification of cash, Investments etc.

(Sgd.) D. S. de Silva,
for Actg. Auditor–General.

RUBBER RESEARCH INSTITUTE OF CEYLON.

Dr. **REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1951.** **Cr.**

	Rs. Cts.	Rs. Cts.		Rs. Cts.	Rs. Cts.
To Personal Emoluments :—			By Cess Collections		1,256,375.79
Senior Scientific Staff	134,249.66		,, Government Grant for Smallholdings Work		168,500.00
Junior Scientific Staff	19,524.60		,, Profit from Dartonfield Group		210,299.92
Office Staff	25,542.45	179,316.71	,, Interest		67,099.13
To Library & Publications :—			,, Sale of Publications		1,360.93
Library	2,844.46		,, Sundry Receipts		3,476.36
Publications	4,421.00	7,265.46			
To Smallholdings Work :—					
Salaries & Allowances	164,327.82				
Travelling & General Exps.	54,722.21	219,050.03			
To Laboratory :—					
Equipment & Working Exps.	11,773.05				
Furniture Replacements	337.31	12,110.36			
To Field & Factory Experiments :—					
Field Experiments	9,629.64				
Factory Experiments	1,423.41	11,053.05			
To Office :—					
Stationery & Office Equipment	3,873.27				
Postage & Telegrams	1,958.99				
Advertising	1,388.57				
Telephones	1,155.00				
Audit	1,500.00	9,875.83			
To Travelling :—					
Expenses of Board Members	2,302.54				
Expenses of Staff	12,943.28	15,245.82			
Carried Over		453,917.26	Carried Over		1,707,112.13

RUBBER RESEARCH INSTITUTE OF CEYLON.

Dr. **REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1951**—*(Contd.)* **Cr.**

		Rs. Cts.	Rs. Cts.		Rs. Cts.	Rs. Cts.
	Brought Forward		453,917.26	Brought Forward		1,707,112.13
To	MAINTENANCE OF BUILDINGS, POWER AND WATER SUPPLY & MOTOR VEHICLES:—					
	General Buildings	1,251,79				
	Bungalows	11,266.77				
	Power & Water Supply	8,616.03				
	Bungalow Furniture Replacements	2,465.03				
	Motor Vehicles	7,144.28	30,743.90			
To	MISCELLANEOUS ITEMS SHARED WITH ESTATES:—					
	Dartonfield Group General Charges	82,074.69				
	Upkeep of Roads & Grounds	2,134.61				
	Factory Upkeep	3,971,29				
	Power Supply	14,892.01	103,072.60			
To	OTHER CHARGES:—					
	Contribution to London Advisory Committee	30,720.25				
	Contingencies	1,759.26				
	Insurance	5,134.63				
	Staff Provident Fund	54,341.65				
	Passages	15,000.00				
	Entertainment Allowance	284.00				
	Dearness allowance to Staff	65,613.06				
	Contribution to Medical Fund	2,562.00				
	Social Services	1,866,99				
	Renovating furniture in Staff Bungalows	490.79				
	Colombo Plan Exhibition	430.52	178,203.15			
	Depreciation		32,809.27			
To	Balance, being excess of Income over Expenditure for the year carried forward to Balance Sheet		908,365.95			
		Rs.	1,707,112.13		Rs.	1,707,112.13

RUBBER RESEARCH INSTITUTE OF CEYLON.

CAPITAL ACCOUNT AS AT 31st DECEMBER 1951.

EXPENDITUTRE

	To December 31st. 1950 Rs.	Transfers between A/cs. Rs.	Additions in 1951 Rs.	Total Rs.
To LAND INCLUDING DEVELOPMENT :—				
Dartonfield	151,936.10		24,506.91	176,443.01
Nivitigalakele	157,518.61		8,494.40	166,013.01
Hedigalla	165,153.41		49,388.43	214,541.84
To BUILDINGS AND LINES				
DARTONFIELD :—				
ESTATE	94,367.62		9,046.75	103,414.37
Headquarters	309,772.37		34,861.01	344,633.38
NIVITIGALAKELE :—				
Estate	40,256.01		2,060.46	42,316.47
Headquarters	21,993.03		—	21,993.03
HEDIGALLA :—				
Estate	44,936.53		11,173.75	56,110.28
Headquarters	18,628.62		—	18,628.62
To FURNITURE AND FIXED EQUIPMENT :—				
Dartonfield	60,885,08	675.00	28 993.69	89,203.77
Nivitigalakele	5,733.70		—	5,733.70
Hedigalla	1,764.25		—	1,764,25
To POWER AND WATER SUPPLY :				
Dartonfield	98,306.00		10,258.65	108,564.65
Nivitigalakele	5,128.09		—	5,128.09
Hedigalla	879.70		1,627.09	2,506.79
To MACHINERY AND TOOLS :—				
Dartonfield	138,974.22	3,555.29	53,243,99	188,662.92
Nivitigalakele	4,754.23		—	4,754.23
Laboratory Apparatus	54,244.39	825.00	17,598.93	71,018.32
London Plant	11,333.34		—	11,333.34
Rs.	1,386,565.30	5,055.29	251,254.06	1,632,764.07

RECEIPTS

	Rs. Cts.	Rs. Cts.
By REVENUE APPLIED FOR CAPITAL PURPOSES :—		
At 31st December, 1950	1,386,565.30	
Less Disposals	5,055,29	
	1,381,510.01	
In 1951	251,254.06	1,632,764.07
Rs.		1,632.764.07

RUBBER RESEARCH INSTITUTE OF CEYLON.

GENERAL BALANCE SHEET AS AT 31st DECEMBER, 1951.

LIABILITIES

	Rs. Cts.	Rs. Cts.
CREDITORS :—		
Sundries	48,697.08	
Receipts in Advance	146,226.00	194,923.08
PASSAGE FUND RESERVE :—		
At December 31, 1950	34,276.64	
Add Reserve for 1951	15,000.00	
	49,276.64	
Less Payments in 1951	18,121.99	31,154.65
DEPRECIATION RESERVE :—		
At December 31, 1950	291,234.05	
Add Reserve for 1951	32,809.27	
	324,043.32	
Less amount transferred	3,640.62	320,402.70
PROVIDENT FUND RESERVE :—		
At December 31, 1950	207,073.22	
Additions during 1951	84,840.17	
	291,913.39	
Less Payments in 1951	32,256.78	259,656.61
MEDICAL FUND :—		
At December 31, 1950	13,410.37	
Additions during 1951	5,267.90	
	18,678.27	
Less Payments in 1951	3,822.53	14,855.74
AUDIT FEE RESERVE :—		
At December 31, 1950	2,243.07	
Add Reserve for 1951	1,500,00	
	3,743.07	
Less Payments	1,979.44	1,763.63
Carried Over		822,756.41

ASSETS

		Rs. Cts.	Rs. Cts.
DEBTORS :—			
Cess Collection for December 1951		128,131.68	
Sundries		58,201.62	186,333.30
ADVANCE ACCOUNTS :—			
ESTATE SUPERINTENDENT			
Dartonfield Group	Rs. 5,367.22		
SMALLHOLDINGS PROPAGANDA OFFICE :—			
General Account	,, 6,660.49		
Soil Conservation A/c.	,, 556.84		
LONDON ADVISORY COMMITTEE :—	,, 6,547.94		
POSTMASTER GENERAL	,, 160.00		19,292.49
ACCRUED INTEREST ON INVESTMENTS :—			13,816.10
PAYMENTS IN ADVANCE :—			20,041.55
STOCKS :—			
Estate Stocks			8,379.49
LOANS TO OFFICERS :—			38,845.11
INVESTMENTS :—		Face Value	Middle Market Value at 31-12-51.
		Rs. Cts.	Rs. Cts.
In Ceylon Government 3½% Loan 1957/62		25,000.00	26,656.25
In Ceylon Government 3 % War Loan 1956/60		20,000.00	20,900.00
Carried Over		45,000.00	334,264.29

RUBBER RESEARCH INSTITUTE OF CEYLON.

GENERAL BALANCE SHEET AS AT 31st DECEMBER, 1951 (*Contd.*)

LIABILITIES	Rs. Cts.	Rs. Cts.
Brought forward		822,756.41
RESERVE FOR STABILISATION OF INCOME :—		
At December 31, 1950	191,798.54	
Additions in 1951	808,201.46	1,000,000.00
APPRECIATION OF INVESTMENTS :—		57,643.75
SURPLUS ACCOUNT :—		
At December 31, 1950	1,797,523.93	
Add Excess of Income over Expenditure for 1951	908,365.95	
Add net value of assets sold plus depreciation thereon	10,640.62	
	2,716,530.50	
Less Contribution to Capital outlay Rs. 251,254.06		
Less Amount transferred to Reserve for Stabilisation of Income ,, 808,201.46	1,059,455.52	1,657,074.98
		3,537,475.14

ASSETS	Rs. Cts.	Rs. Cts.
Brought forward	45,000.00	334,264.29
INVESTMENTS :— (*Contd.*)		
In Ceylon Government 3¼% Home Defence Loan 1952	35,000.00	35,437.50
In Ceylon Government 3¼% Home Defence Loan 1953	30,000.00	30,900.00
In Ceylon Government 3½% National Loan 1964/69	70,000.00	76,300.00
In Ceylon Government 3¼% National Loan 1956	100,000.00	106,000.00
In Ceylon Government 3 % National Loan 1954	5,000.00	5,200.00
In Ceylon Government 3 % Defence Loan 1954	15,000.00*	15,000.00
In Ceylon Government 3 % Sri Lanka Loan 1969/74	750,000.00	772,500.00
In Ceylon Government 3 % Govt. Loan 1966/71	500,000.00	512,500.00
In Ceylon Government 3 % Govt. Loan 1972/77	500,000.00	506,250.00
Ceylon State Mortgage Bank 3¼% Debentures	398,150.00	398,150.00
	2,448,150.00	
*at Par		
CASH BALANCES :—		
At Ceylon Savings Bank		4,037.16
On Savings Deposit (Bank of Ceylon)		8,983.92
In Current account No. 1		729,002.24
In Current Account No. 2		2,675.26
In hand		274.77
		3,537,475.14

The Accounts of the Rubber Research Institute above set forth have been audited under my direction. I have obtained all the information and explanations that I have required and I certify as a result of this audit that, in my opinion, the Balance Sheet is properly drawn up so as to exhibit a correct view of the state of affairs of the Institute as at 31st December, 1951.

Audit Office,
Colombo 7, 25th September, 1952.

(Sgd.) D. S. DE SILVA,
for Actg. Auditor-General.

DARTONFIELD GROUP

Dr. **WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1951.** **Cr.**

		Rs. Cts.	Rs. Cts.			Rs. Cts.
To	EXPENDITURE :—			By	SALE OF PRODUCE :—	
	General Charges	34,322.15			Manufactured Rubber (149,937 lbs.	293,465.84
	Upkeep, Manufacture & Distribution	71,549.33	105,871.48		Creamed Latex (17,112 lbs.)	35,301.11
					Sale of Food Crops 1,228.85	
	Upkeep of Nurseries		12,237.57		Less Expenditure 845.18	383.67
					Planting Material	4,191.71
	Handling & Distribution of budwood & budded stumps		1,448.68			
	Clonal Seedling Nurseries		2,982.63			
,,	Loss on Carting Account		502.05			
,,	Balance being excess of Income over Expenditure transferred to Revenue Account		210,299.92			
		Rs.	333,342.33			Rs. 333,342.33

PROVIDENT FUND.

WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1951.

Dr.					Cr.
	Rs. Cts.		Rs. Cts.	Rs. Cts.
To Payment to 8 Retiring Officers	32,256.78	By balance brought forward from 1950		207,073.22
,, Balance carried forward to 1952	259,656.61	,, Board's Bonus for 1951	40,237.38	
		,, Interest on Officers' Contributions	3,830.34	
		,, Interest on Board's Bonus Account	4,964.66	49,032.38
		,, Bonus paid to 3 Retiring Officers		5,214.13
		,, Interest for 1951 paid to 5 Retiring Officers		95.14
		,, Members' contributions during 1951		30,498.52
	Rs. 291,913.39			Rs. 291,913.39

ESTIMATES AND ACTUAL INCOME STATEMENT FOR 1951.

	Estimate A/c. Rs. Cts.	Actual Income Rs. Cts.	Excess Rs. Cts.	Deficit Rs. Cts.	
Cess Collections	1,108,800	1,256,375.79	147,575.79	—	Under Estimate
Interest	70,000	67,099.13	—	2,900.87	Over Estimate
Sale of Publications	1,000	1,360.93	360.93	—	Under Estimate
Profit from Dartonfield Group	90,000	210,299.92	120,299.92	—	Higher prices realised and better crop.
Sundry Receipts	4,000	3,476.36	—	523.64	Over Estimate
Government Grant for Smallholdings Work	168,500	168,500.00	—	—	——

RUBBER RESEARCH INSTITUTE OF CEYLON.

STATEMENT OF EXCESS AND SAVINGS ON VOTES 1951.

EXPENDITURE

Head of Estimate	Account	Estimate	Capital	Revenue	Excess	Savings	Remarks
1.	Administration of the Board :— Travelling Expenses of Board Members	4,500		2,302.54		2,197.46	Over estimate
2.	Emoluments of Senior Scientific Staff :—	130,268		134,249.66	3,981.66		Increased salary to new staff.
3.	Emoluments of junior Scientific Staff :—	22,947		19,524.60		3,422.40	Non employment of full Staff.
4.	Library & Publications :— A. Library	5,000	961.45	2,844.46		1,194.09	Payments not complete.
	B. Publications	5,000		4,421.00		597.00	Fewer publications issued.
5.	Smallholdings Work :— A-F & H. Emoluments of Staff	179,958		164,327.82		15,630.18	Non employment of full Staff.
	G & I-J. Travelling and General Expenses	80,750		54,722.21		26,027.79	Non employment of full Staff and over estimate.
6.	Laboratory :— A. Equipment and Working Expenses	23,825	14,230.48	11,773.05	2,178.53		Under Estimate and increase purchases for new staff.
	B. Furniture R'mts	500		337.31		162.69	Economies.
7.	Field and Factory Experiments :— A. Field Experiments	11,595		9,629.64		1,965.36	Expmts. postponed for 1952
	B. Factory Experiments	3,000		1,423.41		1,576.59	Less experiments undertaken.

RUBBER RESEARCH INSTITUTE OF CEYLON.

STATEMENT OF EXCESS AND SAVINGS ON VOTES —(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate	Capital	Revenue	Excess	Savings	Remarks
8.	Office :—						
	A-C Emoluments of Office Staff	24,819		25,542.45	723.45		Increased salary to new staff.
	D. Stnry. & Office Equipment	3,000		3,873.27	873.27		Under Estimate.
	E. Postages & T'grs	3,000		1,958.99		1,041.01	Over Estimate.
	F. Advertising	1,000		1,388.57	388.57		
	G. Telephone	1,200		1,155.00		45.00	More vacancies advertised.
	H. Audit	1,500		1,500.00			
9.	Travelling Expenses of Staff :—	21,770		12,943.28		8,826.72	Over Estimate
10.	Maintenance of Buildings Etc. :—						
	A. General Buildings	1,300		1,251.79		48.21	Economies.
	B. Bungalows	12,145		11,266.77		878.23	Economies.
	C. Water & Power Supply	4,000		8,616.03	4,616.03		Unexpected repairs to motors & pumps.
	D. Bungalow Furniture Replacements	3,000		2,465.03		534.97	Economies.
	E. Motor Vehicles	9,500		7,144.28		2,355.72	Due to hire of motor vehicles.
11.	Miscellaneous Items Shared with Estate :—						
	A. Dartonfield Group General Charges	78,990		82,074.69	3,084.69		Under Estimate on D. A. and tools.
	B. Upkeep of Roads and Grounds	1,200		2,134.61	934.61		Tarring roads & repairs to bridge.
	C. Factory Upkeep	10,031		3,971.29		6,059.71	Repairs to machinery not undertaken.
	D. Power Supply	9,850		14,892.01	5,042.01		D. A. to engine room staff not estimated & use of more oils.

RUBBER RESEARCH INSTITUTE OF CEYLON.

STATEMENT OF EXCESS AND SAVINGS ON VOTES—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate	Capital	Revenue	Excess	Savings	Remarks
12.	Other Charges :—						
	A. Contribution to London Advisory Committee	31,200		30,720.25		479.75	Difference in Exchange
	B. Contingencies	2,192		1,759.26		432.74	Over Estimate
	C. Insurance Charges	7,500		5,134.63		2,365.37	Non completion of building programme.
	D. Staff Provident Fund	56,350		54,341.65		2,008,35	Non employment of full Staff.
	E. Passages	15,000		15,000.00			
	F. Entertainment Allowance	500		284.00		216.00	Less entertainment.
	G. Dearness Allowance to Staff	78,000		65,613.06		12,386.94	Non employment of full staff and over-estimate
	H. Contribution to Medical Fund	3,500		2,562.00		938.00	Non employment of full staff and over-estimate
	I. Social Services	2,000		1,866.99		133.01	Economies.
	J. Renovating furniture in Staff Bungalows	3,000		490.79		2,509.21	Work not complete.
13.	Depreciation :—	32,500		32,809.27	309.27		Under Estimate.
14.	Colombo Plan Exhibition :—	5,000		430.52		4,569.48	Payments not complete.
15.	Capital Account—						
	A. Upkeep of Dartonfield Group Immature Areas	61,114	64,839.90		3,725.90		Under Estimate on weeding and pests and diseases.
	B. 2 Intermediate Staff Bungalows Dartonfield	92,000	2,879.36			89,120.64	Work not complete

STATEMENT OF EXCESS AND SAVINGS ON VOTES—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate	Capital	Revenue	Excess	Savings	Remarks
	C. 2 Junior Staff Bungalows Dartonfield	35,000	3,858.74			31,141.26	Work not complete
	D. 8 Double Cottages at Hedigalla	34,400	3,496.50			30,903.50	Work not complete
	E. 4 Double Cottages at Dartonfield	17,200	3,529.22			13,670.78	Work not complete
	F. store and Garages-Dartonfield	7,000	2,425.81			4,574.19	Work not complete
	G. Improving General Amenities at Dartonfield & Hedigalla.						
	a. Additional Water Supply at Dartonfield	10,000	5,514.56			4,485.44	Work not complete
	b. Indoor Sanitation for Junior Staff Bungalows	15,136	4,565.59			10,570.41	Work not complete
	c. Water Supply at Hedigalla	12,000	1,627.09			10,372.91	Work not complete
	d. Improvements to Furniture	5,950	6,214.91		264.91		Under Estimate
	e. Refrigerators	9,050	9,048.75			1.25	
	H. Laboratory & Factory Equipment for Chemist	50,000	18,737.74			31,262.26	Payments not complete
	I. Furniture & Office Equipment	3,300	3,291.50			8.50	
	J. Widening Path to Chummery for motoring	8,000	7,590.85			409.15	Over Estimate
	K. 1 Double Water-seal Latrine for Nivitigalakele	350	159.28			140.72	Over Estimate

RUBBER RESEARCH INSTITUTE OF CEYLON.

STATEMENT OF EXCESS AND SAVINGS ON VOTES—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate	Capital	Revenue	Excess	Savings	Remarks
	L. Renovating Budder's Quarters Nivitigalakele	250	500.34		250.34		Under Estimate
	M. Junior Staff Recreation Club	24,675	17,027.76			7,647.24	Payments not complete
	N. Electric Lights for J.S. Bungalows at Nivitigalakele	3,500				3,500.00	Work not undertaken
	O. Hand Rollers for Hedigalla	2,150				2,150.00	Hand rollers not purchased.
	P. Metalling Factory Premises-Dartonfield	1,000	891.86			108.14	Over Estimate
	Q. Hedigalla Cart Road	10,000	3,283.68			6,716.32	Work not complete
	R. Furniture for Superintendent's Bungalow	5,000	5,141.33		141.33		Under Estimate
	S. Survey of Hedigalla	5,470	5,783.45		313.45		Extra work on survey
	T. Rubber Drying House for Hedigalla	5,000	2,036.51			2,963.49	Work not complete
	U. Latex Tank for Nivitigalakele	1,000	739.40			260.60	Work not complete
	V. Renovation of Buildings	20,440	11,789.43			8,650.57	Work not complete
	W. 6 Single & 14 Double Water-seal Latrines	6,400	5,600.26			799.74	Work not complete
	X. New Pump House for Dartonfield	664	657.75			6.25	Work not complete

RUBBER RESEARCH INSTITUTE OF CEYLON.

STATEMENT OF EXCESS AND SAVINGS ON VOTES—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate	Capital	Revenue	Excess	Savings	Remarks
	Y. Commer Lorry, Jeep & Trailer & Vanguard Estate Car	34,850	40,627.60		5,777.60		Proceeds of sale of old van utilised as authorised.
	Z. Latex Tank for Hedigalla	1,000	1,343.62		343.62		Under Estimate
	Z. (1). Storage Tank Fuel Oil	665	747.85		82.85		Under Estimate
	Z. (2). Garge for New Commer Lorry	1,500	2,111.49		611.49		Under Estimate

ESTIMATES FOR 1953

(Adopted by the Board, 27th October, 1952)

Estimate of Income for 1953

1.	Cess Collections	Rs.	985,600
2.	Government Grant for Smallholdings Work ..	,,	206,600
3.	Interest	,,	96,000
4.	Sale of Publications	,,	1,500
5.	Profit from Dartonfield Group Working	,,	21,250
6.	Sundry Receipts	,,	2,000
		Rs.	1,312,950

ESTIMATES OF EXPENDITURE FOR 1953

1.	**Administration of the Board :—**				
1.	Travelling Expenses of Board Members			Rs.	4,000
2.	**Personal Emoluments :—**				
	Senior Scientific Staff ..	Rs.	140,650		
	Junior Scientific Staff ..	,,	36,397	,,	177,047
3.	**Library and Publications :—**				
	(*a*) Library ..	,,	6,000		
	(*b*) Publications ..	,,	6,500	,,	12,500
4.	**Smallholdings Department :—**				
	Salaries and Allowances ..	,,	232,584		
	Travelling and General Expenses	,,	99,980	,,	332,564
5.	**Laboratory :—**				
	(*a*) Equipment and Working Expenses	,,	37,000		
	(*b*) Furniture Replacements	,,	600	,,	37,600
	Carried over			Rs.	563,711

	Brought forward			Rs.	563,711
6.	**Field & Factory Experiments :—**				
	(*a*) Field Experiments ..	,,	17,800		
	(*b*) Factory Experiments ..	,,	20,000	,,	37,800
7.	**Office :—**				
	(*a*) Salaries of Office Staff ..	,,	36,492		
	(*b*) Stationery and Office Equipment	,,	5,000		
	(*c*) Postages & Telegrams ..	,,	3,500		
	(*d*) Advertising ..	,,	1,000		
	(*e*) Telephone ..	,,	2,000		
	(*f*) Audit ..	,,	1,600	,,	49,592
8.	**Travelling Expenses of Staff :—**				
	Officers' Expenses ..			,,	20,000
9.	**Maintenance of Buildings :—**				
	(*a*) General Buildings ..	,,	2,000		
	(*b*) Bungalows ..	,,	4,500		
	(*c*) Water and Power Supply	,,	6,000		
	(*d*) Furniture Replacements	,,	2,000		
	(*e*) Motor Vehicles ..	,,	8,500	,,	23,000
10.	**Miscellaneous items shared with Estates :—**				
	(*a*) Dartonfield Group General Charges	Rs.	90,371		
	(*b*) Upkeep of Roads & Grounds	,,	1,875		
	(*c*) Upkeep of Bungalow & Club Premises	,,	5,000		
	(*d*) Factory Upkeep ..	,,	6,210		
	(*e*) Power Supply ..	,,	12,083	Rs.	115,539
11.	**Other Charges :—**				
	(*a*) Contribution to London Advisory Committee ..	,,	31,000		
	(*b*) Contingencies ..	,,	1,500		
	(*c*) Insurance Charges ..	,,	9,000		
	(*d*) Staff Provident Fund ..	,,	76,300		
	(*e*) Passages ..	,,	15,000		
	(*f*) Entertainment Allowance	,,	500		
	(*g*) Dearness Allowance to Staff	,,	96,400		
	(*h*) Contribution to Medical Fund	,,	6,750		
	(*i*) Senior Staff Medical Scheme	,,	2,500		
	(*j*) Social Services ..	,,	2,000		
	(*k*) Contribution to B.R.P.R.A.	,,	30,000	,,	270,950
12.	**Depreciation** ..			,,	63,000
					Rs.1,143,592

CAPITAL EXPENDITURE

Agricultural Development	..		Rs. 190,750
Buildings	..		,, 153,700
Machinery and Equipment :—			
Chemical Department	..	Rs. 65,800	
Estate Department	..	,, 96,100	
Agronomy Department	..	,, 4,600	
Head Office	..	,, 3,000	,, 169,500
Cart Roads	..		,, 30,000
			Rs. 543,950

SUMMARY

Income	.. ..		Rs.1,312,950
Expenditure :—			
Revenue	.. ..	Rs.1,143,592	
Capital	.. ..	,, 543,950	,, 1,687,542
Excess of Expenditure over Income			Rs. 374,592

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